Reading the Book of Nature in the Dutch Golden Age, 1575–1715

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Reading the Book of Nature in the Dutch Golden Age, 1575–1715

By Eric Jorink

Translated by Peter Mason



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On the Cover: Willem Moreelse, Portrait of an unknown doctoral student of Utrecht University, upon receiving his M.D. (1647). The text in the young doctor's book reads 'Praesentem monstrat quaelibet herba Deum' (And any blade of grass points to the presence of God). Oil on canvas, 82.5×67 cm. Reproduction of courtesy The Toledo Museum of Art.

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PREFACE

Attention has been focused from different quarters in the last few years on the important role played by the Dutch Republic in the intellectual and scientific culture of seventeenth-century Europe. During the Dutch Revolt against the King of Spain (1568-1648), in which the Northern provinces of the Low Countries seceded from the Habsburg Empire, this loose republican confederation underwent an unprecedented economic, artistic and intellectual growth. The Dutch Golden Age coincided with a period of major scientific discoveries and changes known as the Scientific Revolution. The role of such Dutch scientists and intellectuals as Simon Stevin, Christiaan Huygens, Johannes Swammerdam and Antoni van Leeuwenhoek in this entire process was recognised long ago, as was the fact that the rationalism and mechanistic philosophy of nature of René Descartes, the French philosopher who lived in the Netherlands, made its impact from the same centre of influence. Harold Cook's monumental Matters of Exchange. Commerce, Medicine, and Science in the Dutch Golden Age (New Haven, 2007) has offered a fascinating interpretation of the scientific culture of the Dutch Republic and brought it to the attention of a wider public. From a different perspective, Jonathan Israel's impressive and influential Radical Enlightenment. Philosophy and the Making of Modernity, 1650-1750 (Oxford, 2001) focused on the important role of the intellectual culture of the Dutch Republic in early modern Europe, arguing that it was in the Low Countries, and not in France or England, that the Enlightenment could emerge thanks to the rise of the new science and the rationalism of Descartes and Spinoza. In spite of the differences between the works of Cook and Israel in terms of theme and purpose, they are in line with the picture of their own past that Dutch historians of science have been presenting for a long time. Partly under the influence of Eduard Dijksterhuis' The Mechanization of the World Picture (first edition in Dutch 1950), Dutch intellectual culture is regarded as primarily rational, pragmatic, utilitarian and non-metaphysical, if not anti-metaphysical. No doubt a much older picture that Dutch historians have had of their own past is active in the background in which the important virtues are sobriety, practicality and frugality.

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The aim of this book is to supplement and modify this picture of Dutch scientific culture in the Golden Age, and to put it in the broader context of the European intellectual tradition. First, it seeks to show how nature was regarded as a second book of God, next to the Bible, for a large group of Dutch inquirers into nature. The purpose is by no means to demonstrate that religion was of importance for the rise of science. Rather, working like an anthropologist, I have investigated how nature and res naturae formed the focus for a discourse on God's almightiness in creation that was influential and widely shared. For many in the Dutch Republic, contemplating, investigating, representing and collecting natural objects was an extremely religious and metaphysical activity. Many well-known and lesser-known preachers, poets, humanists and dignitaries turn out to have studied nature through microscopes and telescopes, formed collections of curiosities, written eulogies of God's revelation in the creation, or tackled the difficult question of the relation between the knowledge of their own day and the text of the Bible.

Second, I set out to demonstrate that the major change in the world picture that took place in the seventeenth century can be attributed only partly to the rise of revolutionary new philosophies of nature. It is true that nature around 1700 looked very different from how it had appeared around 1600 to many. Hidden forces and deeper meanings were replaced by discourses on order, structure and regularity. All the same, to understand the shift in the interpretation of nature we also have to take into account the key to interpreting the Book of Nature: the Bible. In other words, we are led into the world of the humanists, theologians and philologists whose importance has been stressed by such scholars as Richard Popkin and Anthony Grafton. The Dutch Republic was the scene of the emergence not only of new philosophies of nature, but also of another branch of intellectual activity: textual criticism, and in particular the rise of radical biblical criticism. One of the central theses of this book is that the unravelling or deconstruction of the old picture of nature characterised by deeper meanings was partly caused by the pioneering exegetical research conducted in the Dutch Republic.

This book does not offer a comprehensive interpretation of the change in the picture of nature in the Golden Age of the Dutch Republic. It focuses primarily on members of the Dutch Reformed Church,

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although Mennonites, dissenters and atheists are not ignored. The period covered extends roughly from 1575 to 1715. The first date has been chosen because it coincides more or less with important political, religious and scientific events. By 1575 large parts of the Northern Netherlands had turned their backs on the authority of the Spanish monarch, which paved the way for the long process of Calvinisation. The same year saw the foundation of the first university in the country, in Leiden, which set the institutionalised practice of science in motion in the Dutch Republic. The rough date for the closure of the period, 1715, is the year in which Bernard Nieuwentijt's influential physicotheological work Het regt gebruik der wereltbeschouwingen (The religious philosopher) was published in Dutch and Isaac Newton entered the stage of Dutch academic life. We are well-informed about these events and their consequences, and although certain views advanced in the literature may be questionable, the year 1715 forms a natural conclusion.

The genesis of this book goes back to 1995, when I began as a Ph.D. student at the University of Groningen. I am extremely grateful to those who supervised and taught me at the time: Klaas van Berkel, Arjo Vanderjagt, M.E.H.N. Mout, and the late John North. I have had fruitful discussions with Florike Egmond, Theo Verbeek, Erik-Jan Bos, Han van Ruler, Wiep van Bunge, Henri Krop, Judith Pollmann, Mirjam de Baar, Ernestine van der Wall, Hans Trapman, Dirk van Miert, Bert van de Roemer, Willem Frijhoff, Wijnand Mijnhard, Sven Dupré, Christoph Lüthy and, of course, Huib Zuidervaart and Ilja Nieuwland. Above all, I thank Rienk Vermij who, in his very personal way, was my intellectual sparring partner over the last fifteen years. I would also like to thank the staff of the Huygens Institute (Royal Dutch Academy of Arts and Sciences), and in particular Henk Wals, for enabling me to complete my research. The present text is based on my doctoral thesis of 2004, of which a commercial edition was published in the Netherlands in 2006. Some changes have been made in that text for the present edition so brilliantly translated by Peter Mason: new literature and insights have been incorporated, the text has been slightly abbreviated, and where necessary I have gone into a little more detail regarding Dutch history for the benefit of the foreign reader. Citations from the Bible are taken from the Authorised King James Version unless indicated otherwise.

ABBREVIATIONS

| ABL | Alle de brieven van Antoni van Leeuwenhoek/The Collected |
|-------------|---|
| ADC | Letters of Antoni van Leeuwenhoek (Amsterdam 1939-) |
| ARS | Archive Royal Society, London |
| ASF | Archivo di Stato, Florence |
| AT | René Descartes, <i>Oeuvres</i> . Eds C. Adam and P. Tannery (Paris 1897–1913) |
| BAV | Biblioteca Apostolica Vaticana, Rome |
| ВСН | De briefwisseling van Constantijn Huygens. Ed. J.A. Worp |
| DI | (The Hague 1911–1917) |
| BL | British Library, London |
| BLO | Bodleian Library, Oxford |
| BML | Biblioteca Medicea-Laurenziana, Florence |
| BUB | Biblioteca Universitaria, Bologna |
| CHO | The correspondence of Henry Oldenburg. Eds A.R. Hall and |
| | M.B. Hall (London 1965–1973) |
| CR | Corpus Reformatorum (Braunschweich 1834-) |
| GAA | Gemeentearchief, Amsterdam |
| GAL | Gemeentearchief, Leiden |
| GCH | De gedichten van Constantijn Huygens. Ed. J.A. Worp (Arn- |
| | hem s.d.) |
| HAB | Herzog August Bibliothek, Wolfenbűttel |
| MPL | Patrologia cursus completus, series Latina. Ed. JP. Migne |
| 1111 2 | (Paris 1857–1912) |
| KB | Koninklijke Bibliotheek, Den Haag |
| KBC | Kongelige Bibliothek, Copenhagen |
| KIT | Koninklijk Instituut voor de Tropen, Amsterdam |
| NA | Nationaal Archief, The Hague |
| | <u>e</u> |
| NNBW | Nieuw Nederlands Biografisch Woordenboek (Leiden 1911-1937) |
| OAD | Oudarchief der gemeente Dordrecht, Dordrecht |
| OAH | Oudarchief der gemeente Harderwijk, Harderwijk |
| OBI | Olai Borrichii Itinerarium 1660-1665. Ed. H. Schepelern |
| | (Copenhagen 1983) |
| OCCH | Oeuvres complètes de Christiaan Huygens (The Hague 1888- |
| 3 3 3 3 1 1 | 1950) |
| | |

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| | |

ABBREVIATIONS

| PUG | Pontifica Università Gregoriana, Rome |
|-----|---------------------------------------|
| UBA | Universiteitsbibliotheek, Amsterdam |
| UBL | Universiteitsbibliotheek, Leiden |
| UBG | Universiteitsbibliotheek, Groningen |
| UBU | Universiteitsbibliotheek, Utrecht |
| WA | Martin Luthers Werke (Weimar 1883-) |

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Fig. 1. Hofwijck, Constantijn Huygens' country estate in Voorburg near The Hague. Pencil drawing, made by Christiaan Huygens in 1658 (UBL).

CHAPTER ONE

INTRODUCTION

'Of this Book we can tell many a wonder...'

On 12 February 1642 a learned and merry company assembled in Voorburg, a village on the outskirts of The Hague. It was the festive opening of the new country estate of Constantijn Huygens (1596-1687) that he dubbed 'Vitaulium' or 'Hof-wijck' (i.e. 'Avoid Court'). Outside the Netherlands he is primarily known as the father of the mathematician Christiaan Huygens (1629-1695). In the Netherlands, however, Constantijn Huygens' fame rests on his role as diplomat and secretary of the Prince of Orange, Frederik Hendrik (1584-1648), but above all as a poet and indefatigable lover and practitioner of the arts and sciences.1 Throughout his long life, which spanned the heyday of the Dutch Golden Age, he was in contact with virtually everyone who counted in the intellectual world: poets, painters, natural scientists. He was on friendly terms with René Descartes, was one of the first to recognise the talent of Rembrandt, and wrote letters of recommendation to the Royal Society for Antoni van Leeuwenhoek, who was an unknown figure at the time.

In order to be able to dedicate himself to his pursuits and to escape from the bustle of affairs at the court in The Hague, Huygens had purchased a large plot of land just outside the seat of government. Work on a Neo-Classical country house commenced there in 1640. The garden that was laid out behind the moat that surrounded the house also corresponded to a strict geometrical pattern. Many guests were to stay in Hofwijck in the ensuing years. Huygens himself spent much time there to devote himself to study, writing poetry, the noble art of gardening, and the contemplation of all that grew and flowered there.

Hofwijck, however, was more than a haven from the life in The Hague, more than the domain of revelry and drinking. The house

¹ On Constantijn Huygens see, for example, Bachrach, *Sir Constantine*; idem, 'Role of the Huygens Family'; Colie, *Some Thankfulnesse to Constantine*; Jardine, *The Reputation of Sir Constantijn*.

and garden were the reflection of a philosophical total concept partly based on Vitruvius' treatise on the connection between geometrical proportions and those of the human body.² It is hard for anyone who visits the remains of Hofwijck today, wedged as it is between the railway line, motorway and office buildings, to form an impression of the intellectual context in which this work of art was created. Those interested should resort to Huygens' poetry. In 1653 Huygens published the poem *Hofwyck*, a text which helps the reader to gain an idea of the conceptions on which the house, and above all the garden, are based.³ Hofwijck proves to be the crystallisation of a complicated system of borrowings and allusions in which Christian symbolism and the classical heritage are the protagonists.

In the 2,800 alexandrines of the poem, Huygens takes the reader by the hand and shows him everything that can be seen in the garden—or, more accurately, what it would be possible to see there a hundred years later. That was the time it would take for the trees to grow to their full height and for the groves to reach maturity. There were allusions to the past and present as well as to the future. Numerous notes refer to Seneca, Virgil, Ovid, Pliny, Cicero and the Bible. The poem is accompanied by a ground plan in which each part of the house and garden has a letter, to which the text is the key. The result is an intriguing system of references: a combination of words and things, of idea and reality. The poem marked the completion of the intertextual and material programme of Hofwijck, or, as Huygens noted with satisfaction in the last verse: 'The big web is completed'.4

We learn from the poem that the house represents a human head, and the front windows stand for the senses. The garden alludes to the trunk and limbs. But behind this symbolism of macrocosm and microcosm lie further layers of meaning. The opposition between urban and rural life that Virgil celebrated in his *Georgics*, the doctrine of the elements, the relation between art and nature, and the recollection of the Garden of Eden all form the context from which Huygens' garden has to be understood. The garden, like the poem that described it, is a tissue of allusions and can be interpreted in a variety of ways.

² Van Pelt, 'Man and Cosmos in Huygens' 'Hofwijck''; De Vries, Wandeling en verhandeling, 149–215; Taylor, Dutch Flower Painting 1600–1720, 24.

³ Huygens, Vitaulium. Hofwyck.

⁴ Huygens, *Hofwyck*, 110. See also: Huygens, *Mijn leven* I, 155.

⁵ Cf. Prest, Garden of Eden; De Jong, Nature and Art.

3

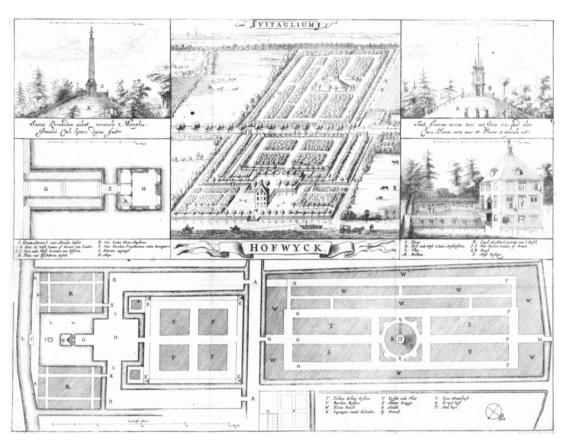


Fig. 2. This print, showing a map, and a bird's view of Hofwijck, was included in Huygens' poem *Vitaulium. Hofwijck* (1653) (KB).

One theme is central here: nature. For an understanding of the complex conceptions of nature that were entertained in the Dutch Republic in the seventeenth century, there is perhaps no better introduction than Hofwijck and no better guide than Constantijn Huygens. In his day nature was regarded as the opposite of culture, but also as the product of culture.6 Art imitated nature; after all, nature was the work of art of God, the first architect. Living nature—flowers, insects, crustaceans formed a popular subject for painters, as the famous Netherlandish still-lifes show.7 According to Huygens, the greatest artist in Holland was Jacob de Gheyn II (1565-1629), whose floral paintings from life had no equal.8 Nature could also be the theme of poetry, as in *Hofwyck* and other poems by Huygens. And it was, of course, the object of the natural science that Huygens frequently eulogised. Observing, reflecting on and describing the wonders of nature was a real passion for the versatile Huygens. These different perspectives merge seamlessly in his person.

To marvel at nature was in Huygens' blood. He was a nephew of Joris Hoefnagel (1542–1600), the learned miniaturist who had produced deceptively realistic illustrations of flora and fauna at the court of Emperor Rudolf II.¹⁰ Like Huygens' poetry, Hoefnagel's water-colours and engravings of insects, shells, birds and flowers were not purely descriptive, but formed a web of moralising mottos. Huygens himself had already been bitten by the bug of nature study as a young man. During his stay in England (1620–1622), he got to know one of the self-professed prophets of the New Science, the English chancellor Francis Bacon (1561–1626). In his own words, Huygens 'always had a sort of sacred respect' for this theoretician.¹¹ At the same time he met the Dutch inventor Cornelis Drebbel (1572–1633) at the English court, who was the first to construct a compound microscope. 'I have

⁶ For a general survey see: Glacken, *Traces on the Rhodian Shore*; Tocanne, *L'idée de nature*; Torrance ed., *Concept of Nature*.

⁷ See, for example, Bergström, Dutch Still-life Painting; Segal, Prosperous Past; Hochstrasser, Still Life.

⁸ Huygens, Mijn jeugd, 74–75.

⁹ Colie, 'Cosmology of Constantijn Huygens'.

Huygens' mother Susanna Hoefnagel (1561–1633) was a sister of Joris Hoefnagel. On Hoefnagel see: Evans, *Rudolf II and his World*, 97–98, 172; Vignau-Wilberg, *Archetypa*, 7–85; DaCosta Kaufmann, *Mastery of Nature*, 79–99.

¹¹ Huygens, Mijn jeugd, 124.

discussed the lenses with Drebbel', Huygens wrote enthusiastically to his parents in 1622.¹² He was particularly fascinated by the microscope and waxed lyrical on the previously unknown wonders of this 'New World'. He vainly tried to get De Gheyn to publish a series of engravings of insects, for, Huygens claimed, it is in the world of the minuscule that humans are confronted with the almightiness of the divine architect.¹³ In his later years Huygens showed great interest in the pioneering researches of Johannes Swammerdam (1637–1680) and Antoni van Leeuwenhoek (1632–1723). As he wrote in 1674 to Henry Oldenburg (ca. 1617–1677), the first secretary of the Royal Society, he always carried a small microscope with him in his pocket.¹⁴

Huygens' fascination with optics was also the basis of his close friendship with René Descartes (1596-1650), the Frenchman who moved to the Dutch Republic in 1629, where he was to conceive and publish his notorious attacks on the authoritative philosophy of Aristotle. 15 In 1635 Huygens attended a lecture by the philosopher on his theory of light. He was deeply impressed by Descartes and exhorted him to remove the ignorance in the world 'by the publication of your Dioptrics'. 16 Huygens was entranced by Descartes' discourses on the New Science. The famous Discours de la méthode, which was accompanied by a treatise on optics, was published in Leiden in 1637. Huygens devoured the work and wrote to Descartes that he prayed to God that the French philosopher should continue to purge science of errors and ignorance.¹⁷ When Huygens looked back on his life in 1679, he noted with some regret that as a boy he had taken the trouble to learn Greek in order to understand Aristotle better. This now turned out to have been a vain enterprise, since 'Descartes had at that time not yet shone new light to unmask the false picture of reality'.18

The Cartesian mechanistic philosophy of nature was indeed to have far-reaching consequences for the philosophy of nature. Cartesian

¹² BCH I, 76-77; Huygens, Mijn leven I, 117, 129.

¹³ Huygens, Mijn jeugd, 132–133; Van Regteren Altena, Jacques de Gheyn I, 40–185; Swan, Art, Science, and Witchcraft, 5–6; 39–122.

¹⁴ BCH VI, 344; CHO X, 456-460.

¹⁵ Rodis-Lewis, *Descartes*, passim; Gaukroger, *Descartes*, 293, 322, 333–335; Clarke, *Descartes*, 130, 250; Jorink, 'Geef zicht aan de blinden'.

¹⁶ BCH II, 118-119; AT I, 325.

¹⁷ BCH II, 334; AT I, 462.

¹⁸ Huygens, Mijn leven I, 73.

physics attributed everything to no more than two explanatory principles: matter and motion. The universe, according to the French philosopher, was a combination of colliding particles, in fact nothing but a gigantic mechanism, a 'fully perfected machine'. Descartes had no time for reflections on occult forces or symbolic meanings. Peter Harrison has characterised the development initiated by Descartes as follows:

Natural objects have been stripped of their intrinsic meanings, and even their qualities and essences have gone. In the physics of Descartes and Newton, simple natural objects are denuded of all but basic quantitative properties. In this new language of nature, syntax has triumphed over semantics. Henceforth, the science of nature will deal with the mathematical or classificatory rules which govern the relations between natural objects.²⁰

Constantijn Huygens was a direct witness to the dramatic changes that shook the seventeenth-century conceptions of nature: the shift from armchair scholarship to rationalism and sense perception, and the replacement of the qualitative Aristotelian philosophy of nature by one that was described quantitatively and in terms of laws. This change is eulogised at many points in the literary work of Huygens.

The fascination of Constantijn Huygens with natural science is nowhere revealed more clearly than in the pride with which he followed the career of his son Christiaan, one of the greatest natural scientists of his day.²¹ In 1645 Huygens senior noted how the young Christiaan mastered the algebra of Descartes and observed 'with extreme astonishment' the talent of his son.²² Christiaan turned out to be a genius. He has gone down in history as the discoverer of the ring around Saturn, the inventor of the pendulum timepiece and many other inventions, but above all as one of the first to describe physical processes in mathematical formulae. In many respects the work of Christiaan Huygens—'my Archimedes', as his proud father called him—can be regarded as the bringing to perfection of the mechanistic philosophy of nature of Descartes.

¹⁹ AT VIII, 14.

²⁰ Harrison, The Bible, 263-264.

²¹ Andriesse, Huygens.

²² Eyffinger ed., Huygens herdacht, 141.

The agitated age in which Constantijn Huygens lived has been aptly described as 'the age of the marvelous'. Not only the vanguard of the Cartesian natural philosophers, but above all a broad spectrum of laymen such as Huygens senior—*liefhebbers, virtuosi, curieux*, as they were called—prove to have been extremely fascinated by nature in all of its phenomenal forms: not only rational explanatory models, but also in particular striking phenomena such as monsters and comets, the previously unknown anatomy of insects, and the collections of curiosities from the Old and the New World filled the most erudite minds in Europe with wonder. Time and again we come across the crucial role that the 'marvels of nature' (*Wundern, merveillles, mirabilia, miracula*) played in the intellectual culture of the seventeenth century. All of these words are etymologically related and can all be derived from the Latin *mirari* (to wonder, ask oneself, want to know) and *mirus* (wondrous, extraordinary).²⁴

This conglomerate of words pointed in two different directions. On the one hand, it could refer to the physical nature of the natural world. What was a wonder? That was a problematic question. In the strictest sense of the word, a *miraculum* was regarded as the result of *supernatural*, divine intervention in the train of events. It was an extremely difficult matter to establish this in theory and practice, which is why fierce polemics were waged on the issue for centuries. Only a few events were regarded as such in Protestant circles in the seventeenth-century Dutch Republic. These were first, of course, the biblical miracles, such as the halting of the celestial bodies in *Joshua* 10:12–13:

Sun, stand thou still upon Gibeon; and thou, Moon, in the valley of Ajalon. And the sun stood still, and the moon stayed, until the people had avenged themselves upon their enemies.

It seemed evident that this was a direct manifestation of God's power through a unique intervention in his own divinely instituted order. 'And there was no day like that before it or after it', the Holy Scripture remarked. Phenomena of their own day such as inexplicable recoveries or remarkable signs in the sky were a good deal more problematic. Were they miracles or not? Much depended on the religious persuasion of the observer and his philosophical orientation. As a reaction to

²³ Kenseth ed., Age of the Marvellous; Daston and Park, Wonders and the Order of Nature; Smith and Findlen eds, Merchants and Marvels; Daston and Park, 'Age of the New'.
²⁴ Daston, 'Marvelous Facts'.

the Roman Catholics, with their plethora of saints and miracles, Protestants were wary of applying the qualification *miraculum*. In their eyes, only those miracles that had taken place in the biblical era were authentic.²⁵

If an event that deviated from the natural order had to be labelled in physical terms at all, Protestants preferred to describe it as praeternatural or extra-natural. This epistemological category, which retained its importance until late in the seventeenth century, covered those phenomena that were certainly not miracles, but were not natural either: night visions, babies born with two heads, rains of blood, anthropomorphic trees and minerals, and the many whales that were stranded on the coast of Holland.²⁶ These wonders attracted considerable reflection and discussion.

However, the term 'wonder' was also often used in a less strict way to designate phenomena that were natural but nevertheless very striking: unprecedented fauna from the East and West Indies, a child prodigy with a head for mathematics, hairy girls, tulips, magnetic force, the appearance of a rainbow and the refraction of light.²⁷ Huygens' friend Descartes devoted separate treatises to the last three phenomena and brought them very explicitly within the domain of rational explanation.²⁸ It will be clear, however, that scholars could differ fundamentally on what was and what was not considered natural. In fact, wonder remained a problematic notion that was partly determined by theological and philosophical factors. As an umbrella term, it covered the natural, the supernatural and the praeternatural.

In his *De civitate Dei* Augustine had already provided an extremely influential account of such staggering natural phenomena. Unlike philosophers such as Descartes, his point of departure was not physical but metaphysical. Everything in nature, from biblical to natural wonders, was attributable solely to God's almightiness. In fact, explanations in terms of natural science were completely irrelevant. After

²⁵ Walker, 'The Cessation of Miracles'; Harrison, 'Newtonian Science, Miracles and the Laws of Nature'. On the Dutch Republic see: Van Deursen, *Plain Lives*, 247–253; Frijhoff, *Embodied Belief*, 111–152; Idem, *Fulfilling God's Mission*, 20–23, 263–265.

²⁶ Céard, La nature et les prodiges; Daston, 'Marvelous Facts and Miraculous Evidence'; Clark, Thinking with Demons, 149–312.

²⁷ See for example Goldgar, *Tulipmania*; Wiesner-Hanks, *Marvelous Hairy Girls*; Mason, *Before Disenchantment*.

²⁸ AT VI, 81–366; AT XI, 384.





Fig. 3. On 19 December 1601, a sperm whale beached on the Dutch coast. In this print, Jan Saenredam included other praeternatural phenomena, such as the eclipses of the sun and the moon of December 1601 and June 1602 (see detail) (KB).

all, the ultimate cause of *all* natural phenomena, both stationary suns, monstrous births and the growth and blossoming of plants, lay in the hand of God. Wonders were not in contradiction with nature: 'For how can anything done by the will of God be contrary to nature, when the will of so great a creator constitutes the nature of each created thing?'.²⁹ So in principle the whole sublunary and superlunary world was a *miraculum Dei*, even though the sinful human spirit was so composed that it paid more heed to extraordinary phenomena than to the course of the planets, the flight of birds, or the construction of the human body. We can hear a loud echo of this view in Huygens. For example, he commented on the projected collection of microscopic studies of De Gheyn:

We are simply rather sated with the wonders of nature that were visible to all up to now; and as usual, our astonishment at them has waned because they are so habitual and familiar to us. Therefore nothing will prompt us to venerate the infinite wisdom and might of the Creator more than to enter this other treasury of nature.³⁰

This brings us to the second dimension of the notion of 'wonder'. The term referred not only to the ontological nature of the object, but above all to the emotional response of the viewer. After all, the entire divine creation was a source of wonder. Wonder was not just an epistemological criterion, but it was also a subjective notion. Admiratio, in the sense of both admiration and astonishment, was naturally provoked, of course, by the unfamiliar or unusual. Still, pious Christians who used their eyes and brains were bound to be convinced that even the most unsightly insect or blade of grass still bore witness to the wondrous perfection of God's creation. The 'wonders of nature' confronted the penetrating observer with the almightiness of God and with his own ignorance regarding natural causes.

Huygens' *Hofwijck* is a eulogy of the wonders of nature in the broadest sense of the word. For Huygens senior, nature was not—as it was for his friend Descartes and his son Christiaan—primarily the object of scientific inquiry. It was more than an extensive, essentially neutral terrain that could be described with the help of optical instruments and mathematical techniques. Although Huygens was fascinated by philo-

²⁹ Augustine, City of God, XXI.8.

³⁰ Huygens, Mijn jeugd, 132.

sophical explanatory models, he was primarily guided by *admiratio*. The study of nature was for Huygens senior also—and primarily—a tribute to the creator. His wonder was of the same kind as that of Augustine. Huygens was not in the first instance a calculating engineer or mathematician, but an exegete. A number of fragments from *Hofwijck* may illustrate Huygens' perspective and show how emphatically we must take that exegetical attitude literally.

In a long passage, Huygens compares his estate with the 'wondrous book' of God's 'six days of labour'. The garden is an allusion to the earthly paradise that preceded the Fall. Nature, however, was not just a *reference* to the Book of Books; it was *itself* a book. Nature was a book of God's wonders that lay waiting to be read, understood and pondered. A stroll through the Book of Nature could prompt the visitor to reflect on God's creation:

What sayst thou, wanderer? If it you please, From leaf to leaf we make our way from sunrise, To when the sun doth close the world's eyes: Of this Book we can tell many a wonder: Though the stars be many, we count their number, And their size: Though the moon its course doth run, Bareheaded, veiled, or a mask doth don; Though our eye she slips, no escape can she find; From her craters and peaks we read her mind.³¹

God's creatures are pages from the Book of Nature. Every creature, every 'member', 'page' or 'letter' is a wonder of God. The leaves of trees, stars, and the phases of the moon: they all signify, they all mean something. Every facet leads to meditation on the *auctor intellectualis* of it all. According to Huygens, the Bible is not the only road to knowledge of God. There is a second divine text:

The other lies at hand: the Book of everything, Of all that in the world he to life did bring.³²

To save humankind, God has revealed himself not only in his word, but also in his creation. God wrote the 'wondrous book' of nature during the six days of the creation, and that book had already proclaimed his goodness and almightiness to the first man. Now, in 1653, Huygens

³¹ *Ibid.*, 63-64.

³² *Ibid.*, 63.

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continued, this book was still open to all. As he strolled through his garden Huygens reflected on God's revelation:

...this Book, this Book of Books, Is as full of inquiry and sweet nooks, As the leaves and herbs of Hofwyck.³³

Thus the poet stops to reflect on every wonder. He descends from the sky, stars, sun and moon to what is to be seen on earth: the elements, plants, animals, and the 'most wondrous of wonders', man.

The description of nature as God's second book seems to have been an intelligent choice on Huygens' part to capture the extremely complex interaction of textual references, description and astonishment in a striking metaphor. Moreover, it is in line with Huygens' visual orientation. Nature is a book full of wonders whose pages are open to all. It is an intriguing expression, especially in relation to Huygens' fascination with natural science.

Cartesianism as benchmark?

Nature as a coherent, meaningful whole that calls for explanation—it is a vision that seems to differ fundamentally from the Cartesian view of nature. Since Descartes, it has been stressed, wonder was increasingly provoked by the underlying laws of nature, and no longer by occult forces, supernatural interventions by God, allegorical meanings of the *res naturae*, etc.³⁴ So the idea expressed in Huygens' poem that nature is a textual system seems to be a throwback to a perspective that was more of a poetic licence than a serious conviction.

As we have seen, there are various points of entry for the study of the views of nature entertained in the Dutch Republic, and particularly those of Constantijn Huygens. In the study of the framework within which nature was understood in the early modern period, the emphasis was for a long time on the rise of new physical explanatory models. The great scientific changes that took place between Copernicus' *De revolutionibus* (1543) and Newton's *Principia* (1689) were qualified half a century ago as 'the scientific revolution' or the comple-

³³ Ibid., 66.

³⁴ See for example: Daston and Park, Wonders and the Order of Nature, 322–323.

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tion of the 'mechanisation of the world picture'.³⁵ Since then, however, the programmatic term 'scientific revolution' has been extended even further in time and range. By now the concept seems to have lost its initial signalling function.³⁶

However that may be, the concepts 'scientific revolution' and 'mechanisation of the world picture' have left their mark firmly on the picture of the practice of science in the Netherlands in the Golden Age. Since Dijksterhuis' standard work of 1950, The Mechanization of the World *Picture*, attention has been focused on the rise of the new physics. Such scholars as Struik, Hooykaas, Van Berkel and Cohen have characterised the nature and style of the practice of science in the Netherlands as descriptive, utilitarian and non-metaphysical.³⁷ Seen from this perspective, a line runs directly from Simon Stevin (1548-1620) via Isaac Beeckman (1588-1637) to René Descartes, ultimately culminating in the work of Constantijn Huygens' son Christiaan. The key words in this connection were mathematicisation and mechanisation. It was a tale of practical minds that solved practical problems, simple builders of fortifications, and mathematical geniuses with a utilitarian bent. The difficulty of catching Christiaan Huygens harbouring metaphysical ideas is often seen as highly characteristic of the scientific culture of the Northern Netherlands. A remark by Hooykaas has often been cited:

When considering Huygens, what is it that I miss? It seems as if from Huygens as well as from the country that brought him forth one dimension is lacking—both are open and wide, yet without height or depth.³⁸

³⁵ Butterfield, Origins of Modern Science; Dijksterhuis, De mechanisering van het wereldbeeld; Idem, The Mechanization of the World Picture; Hall, The Scientific Revolution; Kuhn, Copernican Revolution.

³⁶ Cf. Lindberg, 'Conceptions of the Scientific Revolution'; Cohen, Scientific Revolution; Van Berkel, 'De wetenschappelijke revolutie'; Shapin, Scientific Revolution.

³⁷ Struik, Land of Stevin and Huygens; Hooykaas, Experientia ac ratione; Van Berkel, Isaac Beeckman; Cohen, Christiaan Huygens en de Wetenschapsrevolutie; Van Berkel, Van Helden and Palm eds, A History of Science in the Netherlands, 3–238; Dijksterhuis, Lenses and Waves. Taking his point of departure not from the new physics but from the practice of medicine and natural history, Cook, Matters of Exchange, arrives at a similar characterization of Dutch scientific culture.

³⁸ Hooykaas, *Experientia ac ratione*, 35–36; Van Berkel, *Voetspoor van Stevin*, 16; Cohen, 'Open and Wide'.

Descartes plays a crucial role in this persistent picture of a down-toearth and rational scientific culture lacking in depth in the Netherlands.³⁹ As mentioned earlier, for Descartes the knowledge of nature was the product not of the textual tradition but of reason, and the explanatory principle did not lie in internal forces or the continuous activity of God, but in the laws of attraction and repulsion. This is the source of the modern concept of causality and of the concept of the laws of nature that was considered so crucial. It has often been argued that the major changes in natural philosophy in the seventeenth century had an enormous influence on how the 'wonders of nature' were experienced. After all, the new physics brought many supernatural and praeternatural phenomena within the domain bound by natural laws. The praeternatural was even abolished as an epistemological category in the course of the seventeenth century. The 'wonders' were rationalised away, it is often claimed, in the wake of the rhetoric of Descartes and his followers. It was partly thanks to Cartesianism that nature had been stripped of her hidden qualities, magical forces and emblematic meanings. 40 Astrology, magic and miracles disappeared slowly but surely from scientific discourse in the Dutch Republic. 41 The traditionally large role that stationary suns, monstrous births and ominous signs in the heavens had played in expositions of the wonders of nature was taken over by reflections on the refined anatomy of insects, the working of the eye, and the immeasurability of the universe. Structure and order were the new key words. It is often implicitly or explicitly assumed that there is a link between the 'scientific revolution' or the 'mechanization of the world picture' and the 'disenchantment of the world', which is an equally twentieth-century model. Given the major role attributed to Cartesianism, this already explains the important place occupied by the Dutch Republic in European intellectual culture of the seventeenth century, as emphasised in Israel's influential Radical Enlightenment.42

³⁹ Vermij, De Wetenschappelijke Revolutie, 83–90; Van Bunge, 'Philosophy'; Idem, From Stevin to Spinoza, 34–93.

⁴⁰ See for example: Van Ruler, 'Minds, Forms and Spirits'.

⁴¹ De Waardt, *Toverij en samenleving*, 204–209; Salman, *Populair drukwerk*, 39–133; Fix, *Fallen Angels*; Israel, *Dutch Republic*, 925–931.

⁴² See for example: Thijssen-Schoute, Nederlands cartesianisme; McGahagan, Cartesianism in the Netherlands; Verbeek, Descartes and the Dutch; Idem ed., Johannes Clauberg; Van Ruler, Crisis of Causality; Van Bunge, From Stevin to Spinoza, 34–93; Israel, Dutch Republic, 581–587; 889–908; Idem, Radical Enlightenment, 23–58.

The introduction of Cartesian philosophy in the Dutch Republic certainly ran up against opposition. The University of Utrecht was host to the world première of the New Philosophy in 1640 when Cartesian theses were defended by the Professor of Medicine Henricus Regius (1598-1679). It became clear very soon that the rough manner in which Descartes separated theology from philosophy led to a specific domain and programme for natural scientists. On the other hand, Cartesianism provoked enormous protests from orthodox theologians such as the Utrecht professor Gisbertus Voetius (1589–1676), who claimed that the new philosophy was in conflict with the doctrine of the Dutch Reformed Church and opened the door to materialism and atheism. A bitter debate lasting decades was the result. The fears of orthodox theologians were only confirmed by thinkers who took Cartesian ideas even further: Benedictus Spinoza (1632–1677).⁴³ The latter argued that reason was the key to understanding the Holy Scripture, that God and nature were identical (Deus sive natura), that nature obeyed eternal and unchanging laws, and that the miracles related in the Bible must also be relegated to the land of fable. 44 The supernatural was also swept away on philosophical grounds. As Israel has written:

No other element of Spinoza's philosophy provoked as much consternation and outrage in his own time as his sweeping denial of miracles and the supernatural. In fact, Spinoza stands completely alone among the major European thinkers before the mid-eighteenth century in ruling out miracles.⁴⁵

In other words, the rise of rationalism in the Dutch Republic had extremely far-reaching consequences; Israel even situates the origin of modern thought here. In this connection, the consequences of rationalism are relevant for the objective and method of natural philosophy, for the appreciation of the 'wonders of nature', and for the relation between belief and science. The last two terms threaten to land us in an intellectual minefield. There can be no doubt that the knowledge of nature in early modern Europe has undergone a process

⁴³ Van Bunge, Johannes Bredenburg; Idem, From Stevin to Spinoza, 94–162; Steenbakkers, Spinoza's Ethica; Nadler, Spinoza; Wielema, March of the Libertines; Israel, Dutch Republic, 916–933.

Bouveresse ed., Spinoza, science et religion; Walther, 'Spinoza's Kritik der Wunder'.
 Israel, Radical Enlightenment, 218.

⁴⁶ Snelders, 'Science and Religion'; Vermij, *Bernard Nieuwentijt*; Idem, 'Science and Relief'

of secularisation. In the past centuries much ink has been spilt on the background to this process, and extremely keen polemics have been and still are being waged on the question of whether this should be taken to be a historical fact, a blessing or a curse.⁴⁷

Leaving aside the still heavily charged debates on the condemnation of Galileo's Copernicanism in 1633, the supposed stimulating effect of Calvinism on the scientific revolution, the influence of Darwin's theory of evolution and many other themes, let us focus on what has been written in this connection about Descartes' influence in the Dutch Republic. The general picture that emerges is that the relation between belief and natural science was not very problematic until the interventions of Descartes and Spinoza. Within the academic hierarchy, for example, the philosophical disciplines were assigned an auxiliary position: the theological faculty was at the summit of the hierarchy, and the theologians had the last word. Not only the fairly stable institutional relations but also everyday practices were harmonious in every sense. Dutch builders of fortifications, engineers and mathematicians had little interest in metaphysical questions. Natural philosophers who did share such an interest respected the domain of the theologians and sometimes joined in unanimous praise of God's creation. The Bible and Aristotelian philosophy had been virtually fused and vielded a flexible basis from which to understand the creation.

Descartes, however, declared war on scholastic philosophy and placed philosophy outside the domain of theology. Orthodox theologians and supporters of Descartes (both philosophers and theologians) now engaged in fierce polemics on the crucial problem of the relation between reason and biblical revelation. They often did so in connection with questions of natural philosophy. It is no coincidence that the heliocentric theory of Copernicus, traditionally regarded as one of the most fundamental changes in the seventeenth-century picture of the world, hardly stirred a ripple in the Dutch Republic at first; it was not until around 1650, under the influence of Cartesianism, that it functioned as a short of shibboleth in the discussions between the

⁴⁷ I only mention here: Hooykaas, *Religion and the Rise of Modern Science*; Lindberg and Numbers eds, *God and Nature*; Brooke, *Science and Religion*; Lindberg and Numbers eds, *Science and Christianity*; Harrison, *The Bible*; Idem, *The Fall of Man*; Olsen, *Science and Religion*; Grant; *Science and Religion*; Forshaw and Killeen eds, *The World and the Word*; Van der Meer and Mandelbrote eds, *Nature and Scripture*.

more traditional and the more enlightened elements in the Dutch Republic.⁴⁸ Orthodox theologians adhered to the literal reading of the Bible, which mentioned, among other things, a stationary earth. They were diametrically opposed to those who, partly in the light of the natural philosophical insights of their day, claimed that the Bible should not be interpreted literally. Similar debates were conducted on such issues as magic and witchcraft. The notorious affair provoked by *De betoverde weereld* (The enchanted world, 1691–1693) by the Cartesian preacher Balthasar Bekker (1634–1698) should also be seen against this background.⁴⁹ The radical turn given to Cartesianism in the hands of the small circle of Spinoza and his followers drove the positions even further apart. In the eyes of orthodox theologians, Spinozists, Cartesians and atheists were virtually identical. There was for them an unbridgeable gulf separating piety and philosophy, divine revelation in the Bible and a blind faith in reason.

However, with the dwindling influence of Cartesianism and the introduction of experimental philosophy in the spirit of Boyle and Newton, a new rapprochement between natural philosophy and theology got under way in the Dutch Republic around 1700 and continued until it was rudely shaken by Darwin in the middle of the nineteenth century. The extremely popular work of Bernard Nieuwentijt (1654– 1718), Het regt gebruik der wereldbeschouwingen (1715)-translated three years later by John Chamberlayne as The religious philosopher: or, the right way of contemplating the works of the creator—is traditionally regarded as marking the onset of eighteenth-century physico-theology in the Netherlands.⁵⁰ The most striking characteristic of this tendency, which was represented in England by such figures as John Ray and William Derham, is that it tried to defeat the alleged 'atheists' with the argument that the new natural scientific insights were entirely in agreement with the orthodoxy of the Dutch Reformed Church. Physics was now deployed as a theological instrument. Study of the order and purposiveness of the creation could bridge the gap between belief

⁴⁸ Vermij, Calvinist Copernicans, 137-322.

⁴⁹ Van Bunge, 'Bekker's Cartesian Hermeneutics'; Fix, Fallen Angels; Israel, Radical Enlightenment, 375–392.

⁵⁰ Bots, *Tussen Descartes en Darwin*; De Pater, *Petrus van Musschenbroek*; Hooykaas, 'De natuurwetenschap'; Vermij, *Nieuwentijt*; Van Berkel, Van Helden and Palm eds, *A History of Science in the Netherlands*, 68–95.

and science. Laymen turned in large numbers to experiment with air pressure, to study the astonishing structure of snowflakes, and to calculate the mathematically complicated orbits of planets and comets. All of these phenomena were seen as manifestations of the providence with which the divine architect had created the world in the beginning and still maintained it.

In his 1972 standard work on eighteenth-century physico-theology in the Netherlands, Bots claimed that Cartesianism was not only revolutionary for the practice of philosophy, but that it also marked a rupture in the relation between belief and natural science or between revelation and reason.⁵¹ Although the more recent literature has added a few nuances, this position has never been contested. Israel, for instance, writes:

During the later Middle Ages and the early modern age down to around 1650, western civilization was based on a largely shared core of faith, tradition, and authority. By contrast, after 1650, everything, no matter how fundamental or deeply rooted, was questioned in the light of philosophical reason and frequently challenged or replaced by startlingly different concepts generated by the New Philosophy and what may still usefully be termed the Scientific Revolution.⁵²

Some fundamental criticisms of this standpoint are called for. It cannot be denied that there were a number of violent clashes between orthodox theologians and adherents to the new natural philosophy in the Dutch Republic in the seventeenth century. The importance of Descartes, Spinoza and their followers is beyond question. Nevertheless, by focusing so keenly on one and one line only—the emergence of rationalism and the reactions it provoked—everyday practice, implicit assumptions and a mentality that was perhaps shared in wider circles remain largely hidden from view. Grand narratives such as 'the mechanization of the world picture', the 'scientific revolution' and the 'radical Enlightenment' offer only one of the possible points of entry to the seventeenth-century discourse on God and nature. These concepts are teleological by nature and often lead to simplistic assumptions about a battle between natural science and theology or between reason and superstition.

⁵¹ Bots, Tussen Descartes en Darwin, 1.

⁵² Israel, Radical Enlightenment, 3-4.

The changing perception of nature in the seventeenth century is a process that is difficult to classify and that cannot be written off as the succession of a series of increasingly modern explanatory models, from Aristotelianism via Cartesianism to Newtonianism. What is primarily at stake here is the transformation of a picture, of a mindset that was shared by many. The clearly articulated epistemological views of a few members of the philosophical canon are only one facet of a much larger process in which rhetoric, social relations, the practice of natural science, discussions of the nature of the biblical and classical texts, the belief in miracles and many other themes played an important role.

For instance, we can ask whether, if we speak in this connection of science, we should be content to take the rise of modern physics as our starting point, or whether we should not also take conceptions of what constituted science at the time into account, such as exegesis, the humanist tradition, natural history and the culture of the collecting of curiosities. And is a change in the appreciation of the symbolic meaning of nature purely the result of the rise of rationalism? Should we regard eighteenth-century physico-theology in the first instance as a reaction to Spinoza's system, or does this tendency belong to a longer tradition? Was scientific culture in the Netherlands really as down-to-earth, utilitarian and non-metaphysical as has always been assumed? In other words, are there points on which to anchor a different view of the changing conceptions of the 'wonders of nature' in the Golden Age?

Citations from the Book of Nature

This brings us back to Descartes' influential friend Constantijn Huygens. It should be clear by now that the notion of the scientific revolution will not take us very far in understanding his eulogy of nature. But we shall see that the Book of Nature, on the contrary, offers a fruitful point of entry for understanding contemporary notions of nature, and that this conjures up a completely different picture from the conventional one.

Although Bots, for example, places a lot of emphasis on the revolutionary character of Cartesianism, he is not blind to the theological tradition. As he points out, reflections on God's revelation in the

creation formed a constant undertone in European culture going back to antiquity: 'For an argument from the wonders of nature for the existence of a wise and merciful God is as old as the Bible'.53 In this connection Bots cites more or less in passing a passage that will have a familiar ring for readers of *Hofwyck*. This is the so-called *Belgian Confes*sion of 1561, a document that, together with the Heidelberg catechism and the doctrines of the Synod of Dordrecht (1619) formed the basis of the orthodox Reformed Church in the Dutch Republic. Although that church was never to acquire the status of a state religion in the young Republic, and was in fact just one of the many denominations in the religious landscape (alongside Lutherans, Mennonites, Catholics, Jews and all kinds of sects), it was the privileged denomination.⁵⁴ Those who held a public office were required to subscribe to the doctrines of the Reformed Church. The start of the Dutch Revolt against Spain and the Eighty Years' War that ensued heralded a protracted process of Calvinisation, which included the search for dogmatic foundations for orthodox doctrine. The Belgian Confession, as formulated with Calvin's approval by his co-religionary from the Southern Netherlands Guido de Brès (1522-1567), was translated almost immediately into Dutch. Article II, in the edition of 1619, runs:

We know him [God] by two means. First, by the creation, preservation, and government of the universe, since that universe is before our eyes like a beautiful book in which all creatures, great and small, are as letters to make us ponder the invisible things of God: his eternal power and his divinity, as the apostle Paul says in Romans 1:20. All these things are enough to convict men and to leave them without excuse. Second, he makes himself known to us more openly by his holy and divine word, as much as we need in this life, for his glory and for the salvation of his own.⁵⁵

This is an extremely important formulation. The creation is here regarded as a source of knowledge of God. There are two ways to know him: the creation ('a beautiful book') and the Bible ('his holy and divine word'). Anyone who studied the Book of Nature would be convinced of the existence of God. If he read the Bible too, he could get to know

⁵³ Bots, Tussen Descartes en Darwin, 7.

⁵⁴ Israel, *Dutch Republic*, 361–398, 450–477.

⁵⁵ Bakhuizen van den Brink, De Nederlandse belijdenisgeschriften, 73.

God even better. The implications of these words cannot be stressed too much. Nature is not primarily the field of natural philosophers and engineers, but the starting point for religious meditation. Nature is a book and as such, just like the Bible, the object of exegesis.

Thus upon closer inspection Huygens' words 'Of this Book we can tell many a wonder...' are not poetically inspired, but are a reference to one of the foundations of the culture of the Reformed Church in the Dutch Republic. It is evident here once again how an unsuspected territory lies hidden behind the apparently rational, geometrical structure of Hofwijck, and, more generally, how a complex system of allusions and meanings lies concealed behind what is apparently no more than a description of nature. Unlike the scientific revolution, the Book of Nature is a concept that belongs to Huygens' own day and thereby offers the opportunity to grasp seventeenth-century intellectual culture from a synchronic rather than a diachronic perspective. After all, every member of the Reformed Church in the Dutch Republic knew the Belgian Confession, and everyone who fulfilled a public office—preacher, governor, teacher or professor in any discipline—was required to subscribe to its tenets. Of course, that doctrine was not without its internal discussions or contradictions, but within the circles of orthodoxy (and probably outside them as well), every reference to the Book of Nature will have been immediately understood.

If we proceed like geologists and explore the deeper layers and structures of the intellectual culture of the Dutch Republic in the seventeenth century, we will be struck by the high frequency with which a variety of authors implicitly or explicitly refer to the idea that nature is a divine text, as the following examples can illustrate.

Huygens' friend, the statesman and poet Jacob Cats (1577–1660) who enjoyed such popularity at the time, referred extensively to the Book of Nature in his poem *Ouderdom en Buyten-leven* (Old Age and Country Life, 1655). While Huygens constructed his country estate southeast of The Hague, Cats' Neo-Classical Sorghvliet, designed by Huygens' son Lodewijk, was created on the other side of the city. Here too the house and garden formed a whole, and this proprietor also put his devout thoughts into verse:

When I read the book the Lord has given us meet, A book as thousand honeycombs so sweet... The field bedecked with flowers fair I do behold, And all I view bears witness to the Lord. 22 CHAPTER ONE

The youthful green that I see here arise I read, and thus become more wise. 56

What better way is there to spend one's time than to stroll through gardens and fields, the poet rhetorically asks, to look around 'and to report God's wonders'?

What treasures lie in that blessed book! Salvation there I find if I patiently look!⁵⁷

Much earlier, during his time as a student of theology in Leiden, another friend of Huygens had defended the thesis that everyone, both adult and child, could read God (*Deum legere*) in the world. According to the polymath Caspar Barlaeus (1584–1648), who leaned towards the Remonstrants, the world itself could be regarded as 'nothing but a book, easily accessible and open to all', and in this book there was 'nothing so small that it does not display God's greatness'.⁵⁸

Not only poets of a humanist bent like the orthodox Cats and the less orthodox Barlaeus, but also theologians of various persuasions stressed the divine message of the Book of Nature. One of them was Gisbertus Voetius, the sworn enemy of Remonstrants, Cartesians and other heterodox thinkers. An example is Voetius' commentary on Psalm 19:1 ('The heavens declare the glory of God; and the firmament sheweth his handywork'). The Utrecht theologian argued that the psalmist is here 'leading us from the Book of Nature and the works of God to knowledge of our Creator, and in this way summons us to piety'. 59 The starting point for his exposition of the Book of Nature was the Bible and he did not pay much attention to the insights into physics of his day. Other theologians assigned a more autonomous status to the Book of Nature. The Amsterdam minister Balthasar Bekker (1634-1698), whom Voetian circles regarded as a heretic because of his attack on the belief in magic, argued in his small book on the significance of comets (1683) that knowledge of God could be attained by means of 'the two Books of Nature and of Grace', though for him the text of the Bible was considerably more independent of the Book

⁵⁶ Cats, Alle de Wercken II, 305.

⁵⁷ *Ibid.*, 320.

⁵⁸ Barlaeus, Theses theologicae de cognitione Dei; Theses theologicae de modis cognoscendi Deum.

⁵⁹ Voetius, Thersites Heautoutimeros, 273.

HOF-GEDACHTEN.

20



Het geeft ons beter les, als menigh deftigh man,
Ons certijdts heeft geleert, of heden geven kan.
Wanneer de Plante bloeyt, dan heltse na beneden,
En druckt haer ootmoet uyt, als met geboge leden,
Sy toont geen trots gelaet, al isse wonder net,
Ia schoon haer frisse blom met Peerels is beset.
Maer alsse rijper wert, dan is haer destigh wesen,
Niet laegh gelijck het plagh, maer hooger opgeresen;
Sy geeft haer in de lucht, en siet den Hemel aen,
En blijst oock, alsse sterft, in die gedaente staen.
Siet daer een Sinne-beeldt, daer in men vint besloten,
Al wat tot sijnen troost oyt Christen heeft genoten.
Wat kander beter zijn, als ootmoet na den geest,
En voorsmaeck in het hert van Godes eeuwigh feest.

plane deer fum flectitur, at quamprimmum ut flacetsfere incipit, succedunt illi sais magna capita, qua excuso sor fatim sursim erigoruu. Ioach. Camerar. lib. Emb. ex re herbar.

Waer

Fig. 4. A page from Cats' popular poem *Buyten-leven*: two men and a woman admire God's creative powers in a bed of flowers (KB).

of Nature than it was for Voetius. 60 Bekker claimed that God's eternal power and divinity were nowhere more clearly visible than in the firmament, where they were evident for all to see, including those who did not know the Bible. 61 Another theologian, though a far less controversial one, Andreas Colvius (1594-1672), also distinguished between the two revelations of God. Colvius managed to remain on friendly terms with both Voetius and Descartes and attempted to reconcile the two protagonists. He was extremely interested in the scientific developments of his time, partly because he saw them as a means of combating atheism. He conducted telescopic observations with Isaac Beeckman, corresponded with the Huygens family about microscopes, and assembled a collection of curiosities to be able to contemplate God's greatness in his own study. In a letter to Descartes of 1643, he explained, entirely in the spirit of the Belgian Confession, that humankind could learn to know God's almightiness from the Book of Nature (ex libro naturae) and his truth and love from the Holy Bible.62

The notion of the Book of Nature was popular outside the circles of humanists and theologians as well. The Leiden professor of medicine Johannes van Horne (1621–1670), who trained a handful of brilliant students including Nicolaus Steno (1638–1686), hoped that 'in our century, that we are now going through, and in which the knowledge of anatomy has risen as high as we know it ever to have risen...the last seal of the book of nature may be opened'. One of his students, Johannes Swammerdam (1637–1680), was to become probably the most lyrical interpreter of the Book of Nature. Swammerdam, who was one of the first European scientists to make systematic use of the microscope, described the previously unknown anatomy of bees and other insects constantly in the following terms:

Behold, so very wonderful is God with regard to these little bees, that I venture to say that concerning the insects God's ineffable wonders are sealed, and that those seals are opened when one diligently comes to leaf through the book of nature, the Bible of natural theology, in which God's invisibility becomes visible.⁶⁴

⁶⁰ Bekker, Ondersoek van de betekeninge der kometen, 80.

⁶¹ See also: Bekker, De leere der gereformeerde kerken, 44-45.

⁶² AT III, 680-682.

⁶³ Van Horne, Waerschouwinge aen alle liefhebbers.

⁶⁴ Swammerdam, Bybel der natuure, 394.

For Swammerdam too nature was a Bible, but unlike Voetius, for example, he was primarily concerned with the wondrous structure of God's works that referred directly to the divine creator, and not in the first instance with the analogy with passages from the scriptures.

This list of examples can be extended ad infinitum. Time and again, well or lesser known writers in the Netherlands referred in a variety of contexts to the idea that nature is a text of God. In spite of the different nuances with which this Book of Nature was understood and explained, they all made use of the same language. The Book of Nature was at the centre of a relatively coherent discourse. No matter how much the Dutch Reformists could guarrel among themselves about such matters as the exegesis of the Bible, Cartesianism or heliocentrism, a very broad group lived in the conviction that God was revealed to humankind through the Bible and through the Book of Nature. The Book of Nature could play a unifying role because it was in principle there for all to read. Against the impressive background of the divine creation, the religious differences dwindled to insignificant proportions. It was the duty of every human being—Christian, heathen, atheist—to read this book, even though that naturally did not take place entirely without problems. As Huygens succinctly formulated it:

In clarity unblemished the truth doth lie, The blemish is but in the reader's eye.⁶⁵

The question, of course, is: Who thought, spoke and wrote from the conviction that nature is a text? How was the Book of Nature understood in the Dutch Republic? In which tradition was this intriguing phrase used? How was the relation between the Bible and the Book of Nature defined? Did the turbulent intellectual developments in the Netherlands in the seventeenth century, particularly the Cartesian axiom of the world as a machine, influence the way in which this Book of Nature was understood? And what was the connection between the study of the Book of Nature and the familiar transition from a world-view dominated by hidden meanings to a world in which order, purposiveness and structure reigned?

⁶⁵ Huygens, Hofwyck, 60-61.

The study of the Book of Nature

The statement that the Book of Nature was at the centre of an influential discourse in the Dutch Republic raises a number of problems. If instead of adopting the perspective of the 'mechanization of the world picture' we consider the Golden Age from the vantage point of a picture of nature that was entertained in a wide circle, then it is striking how widespread the passion for observing, anatomizing, collecting, describing, illustrating and classifying all kinds of creatures and phenomena was. 66 Numerous well and lesser known preachers, poets, humanists and local dignitaries turn out to have studied nature through the microscope and the telescope, to have created collections of curiosities, to have written eulogies of God's revelation in the creation, or to have racked their brains regarding the question of the relation between contemporary knowledge and what was written in the Bible.

Humanist culture—the scholars who pored over Greek, Latin, Hebrew and Aramaic texts that had been handed down from antiquity—was important in this connection. After all, at a time when the creation was regarded as a text, and knowledge of nature—at any rate down to Descartes—was mainly based on the canon, there was perhaps no group of scholars closer to the Book of Nature than the humanists and philologists. Philology was practised at an exceptionally high level in the Dutch Republic since the days of the Leiden professors Justus Lipsius (1547–1606) and Joseph Scaliger (1540–1609).⁶⁷ The fact that such Dutch humanists as Caspar Barlaeus, Gerardus Johannes Vossius (1577–1649) and his son Isaac (1618–1689) had a more than superficial interest in the wonders of nature has passed, however, virtually unnoticed.⁶⁸ It is only in the last couple of decades that the intrinsic connection between humanism and research on nature in early modern

⁶⁶ Egmond, Adriaen Coenen; Van Berkel, Citaten uit het boek der natuur; Egmond, Jorink and Vermij eds, Kometen, monsters en muilezels; Swan, Art, Science and Witchcraft, 29–122; Egmond, Hoftijzer and Visser eds, Carolus Clusius; Cook, Matters of Exchange; Huisman, Finger of God; Goldgar, Tulipmania; Marcócsy, 'Museum of Wonders or Cemetery of Corpses?'.

⁶⁷ See for example: Waszink, 'Classical philology'; Enenkel and Heesakkers eds, *Lipsius in Leiden*; Grafton, *Scaliger*, Idem, *Athenae Batavae*.

⁶⁸ Cf. Rademaker, Gerardus Johannes Vossius; Blok, Isaac Vossius.

Europe has been demonstrated.⁶⁹ There seems to have been an equally close connection between philology, emblematism and the practice of natural history.⁷⁰ The latter (the study of animate and inanimate nature, countries and peoples) differed from natural philosophy (reflection on the purpose and cause of physical processes) by a more descriptive approach. Seen from the perspective of the seventeenth century, the practice of 'exact' natural philosophy was only a relatively marginal affair compared with the activities of physicians, botanists, explorers and collectors. The important role played by the Dutch Republic in these fields has been widely demonstrated.⁷¹ It is precisely here that we regularly find notions that can be understood on the basis of the Book of Nature, not only in relation to emblematism, but also in the apparently value-free, descriptive form of natural history.

Interest in the history of the expression 'Book of Nature' is growing internationally. The *liber naturae* turns out to have been an extremely popular expression since Christian antiquity, and its strength appears to lie precisely in a certain degree of vagueness. The expression probably goes back to biblical passages such as the first verse of *Psalm* 19 quoted by Voetius ('The heavens declare the glory of God'). As far as we know, it was first explicitly used by Augustine (354–430) in his polemic with the Manicheans, in which he cited both the Bible and the Book of Nature as evidence of God's almightiness. In his commentary on *Psalm* 45 he wrote:

Let the Holy Scripture be a book for you so that you may hear these things; let the world be a book for you so that you may see these things. Only those who know how to read the letters can read in those books; but in [the book of] the whole world the illiterate layman can read too.⁷³

⁶⁹ See for example: Grafton, *Defenders of the Text*; Idem, *New Worlds, Ancient Texts*; Idem, 'New Science and the Traditions of Humanism'; Blair, *Theatre of Nature*; Pomata and Siraisi eds, *Empiricism and Erudition*; Forshaw and Killeen eds, *The Word and the World*; Van Miert, *Humanism in an Age of Science*.

⁷⁰ Harms, 'On Natural History and Emblematics'; Ashworth, 'Natural History'; Bono, *Word of God*, 67–198.

⁷¹ See for example: Freedberg, 'Science, Commerce and Art'; Cook, 'The New Philosophy in the Low Countries'; Idem, *Matters of Exchange*.

⁷² Van Berkel and Vanderjagt eds, *The Book of Nature in Antiquity and the Middle Ages*; Van Berkel and Vanderjagt eds, *The Book of Nature in early Modern and Modern History*; Methuen, 'Interpreting the Books of Nature and Scripture'.

⁷³ Augustine, Enaratio in Psalmum XLV, 6-7.

Let us leave the implications of these words to one side for the time being and focus on the history of the expression. After the unanimous consensus that it was Augustine who codified the expression, the literature points in different directions. First of all there are the literary historians such as Ernst Curtius, who have compiled impressive surveys of the passages in Western literature where the metaphor of the book can be found.74 This approach yielded an interesting volume of material which demonstrated that the Book of Nature, together with such notions as 'the world as theatre', is an expression that has been frequently used. Its content could vary depending on the conditions in which it is found. Augustine used it in direct relation to the Bible. In the early modern era, various thinkers such as Paracelsus, Montaigne and Galilei had recourse to the same expression. For the physician and alchemist Paracelsus (1493-1541), the Book of Nature was the universe visible to every enlightened layperson and it had to be understood independently of the classical and biblical tradition. Montaigne (1553-1592) described 'this great world' in his Essais as 'the mirror in which we should look to know ourselves rightly. In short, I want it to be the book of my student'. Galileo Galilei (1564–1642) interpreted the expression in a completely different way: the universe certainly is a book, but the biblical revelation is completely irrelevant. The Book of Nature 'is written in the language of mathematics, and the signs are triangles, circles and other geometric figures, without which it is impossible to understand just one word of it'. 75 So for Galileo the Book of Nature could only be deciphered by those with a grasp of mathematics.

These examples (and there are countless others) illustrate both the popularity and the flexibility of the phrase 'Book of Nature': a polemical instrument, a moral guideline, a divine revelation, matter for mathematicians. We can provisionally conclude that the Book of Nature confronts us with a long, rich and complicated tradition that was still very much alive in the Dutch Republic; and that we shall have to steer a course of investigation between more underlying, often implicit presuppositions, on the one hand, and a more positivist approach, on the other. This is the only way to gain a deeper insight into the sta-

⁷⁴ Curtius, Europäische Literatur und Lateinisches Mittelalter, 300–323; Nobis, 'Buch der Natur'; Rothacker, Das 'Buch der Natur'.

⁷⁵ Galilei, Il Saggiatore (1623) in: Le opere di Galileo Galilei VI, 232.

tus of the Book of Nature. These considerations should be borne in mind when we study the expression in the context of the culture of the Dutch Reformed Church. The citations from the *Belgian Confession*, Huygens, Voetius, Bekker and Swammerdam suggest that they shared a single, more specific interpretation, which we could describe as the a priori assumption that the Bible and the Book of Nature form a dual unity. The second book was understood in terms of the first; reflections on the Book of Nature were embedded in the Bible. In other words, at first sight the Dutch interpretation of the Book of Nature seems to be much closer to the Augustinian tradition than to that of Paracelsus or Galileo. We seem to find ourselves in the twilight zone between revealed and natural theology, between the Bible and the creation that is visible to all, or, as Swammerdam described the Book of Nature, 'the Bible of natural theology, in which God's invisibility becomes visible'.⁷⁶

It is emphatically not the intention to deny the influence of rationalism. The aim is rather to correct the rather one-sided picture of the religious implications of research on the natural world in the seventeenth-century Dutch Republic on the basis of the discourse on the Book of Nature. The focus is therefore not in the first instance on the world of the canonical natural philosophers such as Christiaan Huygens, Descartes or Stevin, but on that of the well and sometimes lesser known scholars and curiosi such as Constantijn Huygens, Bernardus Paludanus, Petrus Hondius, Andreas Colvius, Johannes de Laet, Johannes de Mey, Nicolaes Witsen, and Johannes Swammerdam. I shall try to chart the common domain from which they operated, which means taking not only the explicitly formulated notion of the Book of Nature as the starting point, but also the underlying axiom: the creation as the second revelation of God. This conviction was often reflected in the expression 'Book of Nature', but sometimes also in accounts of the 'legibility' of nature and in meditations on the divine author or artist. One has only to recall Cats' lines:

The youthful green that I see here arise I read, and thus become more wise.⁷⁷

⁷⁶ Swammerdam, *Bybel*, 394

⁷⁷ Cats, Alle de Wercken II, 305.

The position that is being argued here is that beside, or rather beneath, the new rationalist philosophies of Descartes and Spinoza, an old and influential current continued to run in which scientific inquiry and religious reflections flowed naturally into one another. Belief and reason, revealed and natural theology, the natural and the supernatural were not opposites, but merged with one another. Besides the unmistakably major transformations that we can distinguish in the physics of the seventeenth century, for instance, there was a large measure of continuity in thinking about nature as a signifying whole, as proof of the existence of the divine artist, architect or author. Dutch conceptions regarding the Book of Nature were firmly planted in the Augustinian tradition. Members of the Reformed Church did not view it as an autonomous text that could be deciphered with the aid of mathematical techniques, for example. The Book of Nature was a dual unity with the Word of God, in the sense that the former was understood in terms of the latter. Meditations on the Book of Nature were directed and sanctioned by the Holy Scripture.

This hermeneutic principle was hardly contested before about 1650. There were differences in the way in which passages in the Bible and the Book of Nature were interpreted, but within the broader framework of Protestant orthodoxy the direct connection between the two books of God was not called into question. This situation changed in the middle of the century. Questions were now raised in certain learned quarters regarding the traditional and unquestioned applicability of the Bible to the Book of Nature. Nature was still regarded as a revelation of God, but it was no longer the analogy with biblical passages, but increasingly the order and structure of the creation itself, that were signs of his almightiness. What now emerged forcefully into the foreground was what is usually referred to as the argument from design: the conviction that the complexity and purposiveness of nature must point to the existence of a divine auctor intellectualis. In other words, the Book of Nature tore itself away from biblical orthodoxy and became an autonomous entity. It is tempting to attribute this process solely to the progress of rationalism, but for a proper understanding we must also take into account the debates that raged in the Dutch Republic on the question of exegesis. After all, since the Bible was regarded as the exclusive key to the interpretation of the Book of Nature, it is not improbable that the change in the relation between the two was caused by developments in the way in which scholars interpreted the

canonical texts. In the middle of the seventeenth century, philologists from the School of Scaliger, deeply religious followers of Cocceius, and radical thinkers like Isaac Vossius arrived from different perspectives at the conclusion that the biblical text was also problematic on many points and could not be unambiguously regarded as a source of timeless and universal truths. It was in particular the rise of biblical criticism that led to a new interpretation of the Book of Nature.

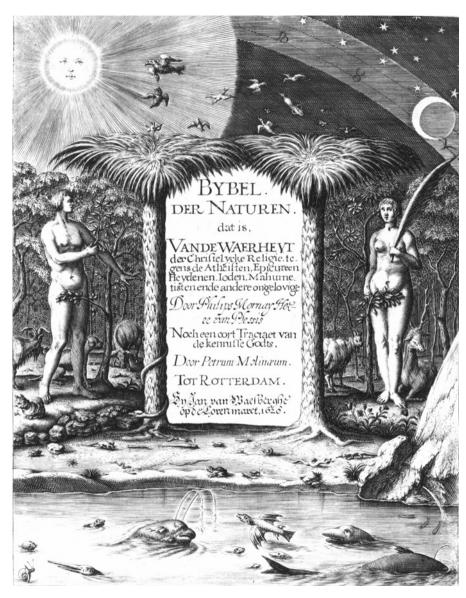


Fig. 5. Frontispiece of the second edition of the *Bybel der naturen* (1626), the Dutch translation of Du Plessis' *De la verité de la religion chrestienne*: Adam and Eve in the Garden of Eden, knowing God through the Book of Nature (KB).

CHAPTER TWO

THE INTERPRETATION OF THE BOOK OF NATURE DOWN TO AROUND 1660

1. The strength of tradition

Liber, theatrum, speculum

The Netherlands, February 1642: the controversy between Descartes and Voetius reaches a provisional climax in Utrecht. The academic senate asks the city fathers to ban a work by Professor Regius, the first member of the university to defend the French scholar. According to Regius' alarmed colleagues, he teaches this 'certain type of philosophy, mostly overthrowing the foundations of [Aristotelian] philosophy'.1 They therefore beg the city authorities 'to stop this evil and to avert the danger that threatens the academy'. In view of the expected 'inconveniences and damage', Regius is severely reprimanded.2 The festive opening of the country estate Hofwyck in Voorburg by Descartes' friend Constantijn Huygens coincides with these heated debates in Utrecht. Yet more peaceful is the study of the Amsterdam minister Johannes le Maire (1567–1642). Far from the world of the prominent scholars, the aged reverend puts the finishing touches to his rambling and unoriginal book, whose title can be translated as Vivum theatrum, that is, live theatre: on which is presented the most adorable property of God, his almightiness, and that ex libro naturae, the book of nature, which is the macrocosm, the large world, and microcosm, the small world, mankind: and ex libro gratiae, the book of grace; which is the *Holy Scripture.*³ Anyone wanting to know something about the impact of the Utrecht debate on Cartesianism must put this book aside: there is no indication that Le Maire was aware of the debates that were going on. His book bears not the slightest trace of doubt or alarm, only the certainties of the faith.

¹ Duker, Gisbertus Voetius II, appendix LIV.

² Kernkamp ed., Acta et decreta Senatus I, 158–159.

³ Le Maire, Vivum theatrum, 'Aen den leser'.

Le Maire's Vivum theatrum is one of the many treatises in which well-known and in particular less well-known Dutch authors explain that God is wonderful, 'not only in himself, but also in his works'.4 This book did not contain any profound reflections on the unlimited possibilities of human reason. What it did offer, like Huygens' poem Hofwyck, was a systematic survey of the wonders of the divine Creation. There is, however, a difference in orientation. While the worldly Huygens strolled through his grounds as he drew his reader's attention to the beauty of what grew and flourished there, the minister referred mainly to ancient books. His work referred not to outdoor life but to the library. Le Maire did briefly mention the voyages of discovery of his nephew Jacob le Maire (ca. 1585-1616), who had circumnavigated the world in 1616, and the famous anatomical dissections by the Leiden professor Petrus Pauw (1564–1617) and the Amsterdam physician Nicolaes Tulp (1593–1674), but otherwise his text was mainly based on time-hallowed texts. The most important of these was the book of Genesis. With reference to the six days of the Creation, Le Maire conjured up the wonder that is aroused by contemplation of the firmament, the course of the sun, stars and planets, the constitution of the earth and everything that lives on it. How incomprehensible is the perfection and 'immeasurable greatness' of the cosmos!⁵ How great is the power 'of the Lord, and his wisdom, who without labour, without instruments, without materials, without space and the mediation of time, but with one word alone, has created such a multitude of birds and fishes' and other creatures! Like Huygens, Le Maire constantly has recourse to figurative language to get his message across. Nature is a theatre in which mankind is set to contemplate the wondrous works of God. Man is a microcosm that reflects the universe or macrocosm. The Creation is a timepiece, a work of art or a mirror 'wherein can be seen the almightiness of God'.7 The world is also likened to a house. When people want to build even the most humble dwelling, they are endlessly occupied with calculations, drawings, materials and tools: 'But the almighty creator of all things has, without any of these things, in one moment, with one word alone, made all those bodies of such

⁴ *Ibid.*, 3.

⁵ *Ibid.*, 3.

⁶ *Ibid.*, 43.

⁷ *Ibid.*, 161.

almost immeasurable greatness'.8 The metaphors to describe God's Creation are here mutually interchangeable: the theatre, the work of art, the building. But one image was clearly a favourite of Le Maire: the 'liber naturae, the Book of Nature'.9 This book is always open and is written 'in folio, in the largest format' so that everyone can read it at all times and in all places. God's Creation is a 'long and large letter; not only written to the faithful, but to all men, to all who are enlightened by the light of nature'. Anyone can read the book 'as they move, yes, even as they walk' provided he knows the key to this book, viz. the Holy Scripture. Time and again, entirely in the spirit of Augustine, Le Maire refers to the idea that man can get to know God from the Bible and the Book of Nature. The liber naturae does not function by itself, but can only be understood with the help of the liber gratiae.

The idea that God's Creation can be compared with a book, a theatre or a mirror has a respectable and multi-faceted history.¹³ Basically, it goes back to two different sources: classical philosophy and, above all, the Bible and the church fathers. In theory these pagan and Christian writings had a very different purport, but in the eyes of the Dutch Protestants they formed an indivisible whole. By far the most important source of the doctrine of God's two books was the Bible. The Book of Nature, as orthodox Protestants understood it, was embedded, as it were, in the Book of Grace: both went back to the Word of God. The book of Genesis described how each of the days of the Creation followed a divine utterance: 'And God said, Let there be light: and there was light'. 14 First was the Word, then the Creation. That is how God created man. 'And out of the ground the Lord God formed every beast of the field, and every fowl of the air, and brought them unto Adam to see what he would call them: and whatsoever Adam called every living creature, that was the name thereof'. 15 These passages about God's creative word formed the basis in the entire Christian tradition for

⁸ *Ibid.*, 3.

⁹ Ibid., 409.

¹⁰ Ibid., 410.

¹¹ *Ibid*.

¹² Ibid

¹³ Curtius, Europäische Literatur; Blair, Theatre of Nature; Grabes, Speculum, Mirror und Looking-glass; Christian, Theatrum mundi; Van Berkel and Vanderjagt eds, Book of Nature in Antiquity and the Middle Ages.

¹⁴ Genesis 1:3.

¹⁵ Genesis 2:19.

writings about the *verbum Dei*, Adam's knowledge of nature, and the language of Paradise. Before the Fall, the Creation seemed to have been a book in which words and things were identical. In those days there was no Bible, only the 'speechless teachings of heaven and earth', as Calvin, for example, believed. After the Fall, the Original Sin and Babel, however, the tie between divine knowledge and human knowledge was severed. Language became confused and the peoples were scattered. All the same, the hand of the Lord could be recognised in his Creation. Psalm 104 was entirely devoted to God's majesty in the Creation: O Lord, how manifold are thy works! In wisdom thou hast made them: the earth is full of thy riches'. Language of nature, and the

The Creation is often presented in the Bible as a witness—and one endowed with speech. It is these passages that were among the sources of Protestant reflection on God's revelation in the Creation, namely in the Book of Nature. Balthasar Bekker, for instance, considered that the idea that the world is 'a fair book' was derived from *Psalm* 19:1. 'This is about the language of the Scripture. For what else did David mean when he said: *The heavens declare the glory of God; and the firmament sheweth his handywork*'?²⁰

Numerous other passages taught similar lessons: how the sun, the moon and the stars, the succession of the seasons, the grass and the trees, even the tiniest ant bear witness to God's love and almightiness. But the Bible also taught how earthquakes, storms, plagues of grasshoppers, thunder and lightning were expressions of divine wrath. The course of nature was one of the sources from which one could deduce divine providence. The Creation was the testimony of his glory for the last of his works, man. The apostle Paul in particular, who was explicitly cited in the *Belydenisse des gheloofs*, was to have an enormous influence on the idea of the *liber naturae*. In his *Epistle to the Romans*, Paul had written about the ungodly:

¹⁶ Harrison, *The Bible*, 205–265; Bono, *Word of God*, 11–24, 45–63; Idem, 'The Two Books and Adamic Knowledge'.

¹⁷ Calvin, Commentarius in Genesin, CR 51, 10.

¹⁸ Psalm 104:24.

¹⁹ Philipp, *Das Werden der Aufklärung*; Laplanche, *L'évidence du Dieu chrétien*; Krolzik, *Säkularisierung der Natur*; Harrison, *The Bible*, 64–160.

²⁰ Bekker, Leere der gereformeerde kerken, 44.

For the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead; so that they [the ungodly] are without excuse.²¹

Paul's train of thought was explained in the Christian tradition as follows. God has revealed himself to the Christians through his Holy Word. However, the heathen too, who after all have not received the grace of faith, have no excuse: they too can see from the works of the Lord that he exists. The Creation is visible to all, after all, and however dimmed human intelligence may be after the Fall, even those who deny him can recognise his goodness in his works.

Paul's *Epistle to the Romans* brings us to an extremely complex question, namely that of whether God's work can be grasped by reason. We here abandon the domain of revealed religion to enter that of natural theology. In accordance with the way the term was used in the Netherlands in the seventeenth century, we here define it as the knowledge of God that is not directly based on the Bible, but on human reason. The relation between natural and revealed theology, like that between belief and natural science, has been the subject of endless debate.²² Does true Christian belief admit of other sources of knowledge besides the Bible? How can man come to know Christ through reflection on the Creation? Where does reason end and faith begin?

For Christians the Bible was the revealed Word of God. Greek and Roman philosophers, however, had already profoundly reflected on the question of what forces were concealed behind the course of natural events.²³ Was it Nature herself? Was there one god, or were there several gods? 'But as to the question upon which the whole issue of the dispute principally turns', wrote Cicero in *De natura deorum*,

whether the gods are entirely idle and inactive, taking no part at all in the direction and government of the world, or whether on the contrary all things both were created and ordered by them in the beginning and are controlled and kept in motion by them throughout eternity.²⁴

The influence of the classics was enormous. This was sometimes a negative one, as in the case of Epicurus, who taught that the universe

²¹ Romans 1:20.

²² See for example: Raven, *Natural Religion*; Lagrée, *La raison ardente*; Barr, *Biblical Faith and Natural Theology*.

²³ Gerson, God and Greek Philosophy; Pelikan, Christianity and Classical Culture.

²⁴ Cicero, De natura deorum I, i.

was a chaotic, arbitrary conglomerate of atoms of matter. To a Christian this could mean only a complete rejection of divine providence, so the Epicurean doctrine was combated most vigorously.²⁵ Calvin did not mince his words: the school of Epicurus was a 'pigsty'.²⁶ In article XII of the *Belydenisse des gheloofs*, 'the damnable error of the Epicureans', was rejected, 'who say that God does not intervene anywhere and allows everything to happen by chance'.²⁷

But there were pagans whose ideas, when suitably modified, could be reconciled with the Christian conceptions, and they were regarded as a powerful support for Christian monotheism and the doctrine of divine providence. Besides Cicero, they included Plato and Aristotle. Notions of causality played a crucial role in the vision of Aristotle. Aristotelian physics proved to be an excellent support for Christian conceptions of the Creation, according to which God had created everything 'after his nature'. The same can be said of Aristotle's writings on organic nature. Was not everything in nature derived from a single cause, the Prime Mover?

Other unbaptised (natural) philosophers also contributed to the Christian convictions that God's hand could be recognised in the Creation. Their works were still often cited in the seventeenth century. It can even be stated that there is a clear line leading from pagan natural philosophy to the very Christian physico-theology of the eighteenth century. They were ideas that had already been formulated in pagan antiquity and which contributed to the conviction that the cosmos was a theatre, a mirror or the Book of God. After all, the order, purpose and beauty of all Creation indicated the hand of an intelligent designer. Of course, for the Greek and Roman philosophers this was not the God of Adam and Abraham. They identified God with Nature, or spoke of the Demiurge or a supreme deity. Ptolemy (2nd century AD), whose astronomy was so influential down to late in the seventeenth century, regarded the eternal and unchanging course of the celestial bodies as the mirror of a higher order.²⁹ Galen (129-ca. 210 AD) enjoyed a similarly unquestionable status for a long time in the field of medicine. His researches convinced him that the miraculous

²⁵ Osler ed., Atoms, 'Pneuma' and Tranquility.

²⁶ Calvin, *Institutes* I, V, 5.

²⁷ Bakhuizen van de Brink, Belijdenisgeschriften, 73.

²⁸ Van Steenbergen, Aristote en occident; Grant, 'Reaction of the Universities'.

²⁹ Taub, Ptolemy's Universe.

internal structure of humans and animals could only be attributed to a wise creator.³⁰ Every part of the body had a function, nothing had been made without wisdom, he wrote in his *De usu partium*.

Pliny the Elder (23-79 AD), the author of an encyclopaedic Naturalis historia, was also an important source of inspiration.³¹ Pliny described all kinds of mirabilia with almost childlike enthusiasm in this compendium: the course of the heavens, the monsters that were believed to inhabit the far corners of the world, the hidden powers of plants and stones, the wondrous works of art that man had created, and 20,000 other matters. Almost every early modern natural inquirer and collector fell back on Pliny.³² In the introduction to his work Pliny did not give a clear answer to the question of whether all these wonders should in the last instance be ascribed to the almightiness of a higher power. In the work proper, however, there is constant reference to the remarkable structure of all that exists and speculation about the higher power supposed to be responsible for it. Thus Pliny asks himself rhetorically how all of the bodily functions are visible in even the most minute insects, 'showing a craftsmanship on the part of Nature that is more remarkable than in any other case'.33

Cicero has already been mentioned. In his *De natura deorum* the Roman orator provided a survey of ideas about the activity of a higher power in nature. Various points of view are presented in the form of a debate. The words that Cicero puts in the mouth of the Stoic Balbus in particular were often to be cited in the early modern period. The Stoics identified God with nature, and assumed a direct link between the natural order and human society.³⁴ The study of nature was thus a moral obligation and a religious activity. Balbus discusses the course of the planets, the anatomy of the human eye, the love of animals for their young, and asks himself the rhetorical question: Is there anything 'which does not clearly display the rational design of an intelligent being?'³⁵ The interaction between things is so refined that it cannot come about fortuitously.

³⁰ Galen, De usu partium II, 10; IV, 360; VII, 1.

³¹ Beagon, Roman Nature; French, Ancient Natural History, 196–255.

³² Labarre, 'Diffusion de l'*Historia naturalis*'; Nauert, 'Humanists, Scientists and Pliny'; Findlen, *Possessing Nature*, 61–70; 76–77; Ogilvie, *Science of Describing*, 121–130.

³³ Pliny, Naturalis historia XI, i.

³⁴ Pohlenz, Die Stoa; Sambursky, Physics of the Stoics; Osler ed., Epicurean and Stoic themes.

³⁵ Cicero, De natura deorum II, xlvii.

When you look at a sun-dial or a water-clock, you infer that it tells the time by art and not by chance; how then can it be consistent to suppose that the world, which includes both the works of art in question, the craftsmen who made them, and everything else besides, can be devoid of purpose and of reason?³⁶

For the Christians, the Stoics provided a decisive argument against the Epicureans: chance was ruled out. *De natura deorum* was thus cited with approval, and was to go down in history as one of the classics of natural theology.³⁷ However, Christian writers stressed, man could apply reason to learn something about divine providence from the order of nature, but by far the most important source was the Holy Scripture. Aristotle, Galen, Pliny and Cicero may have supplied arguments for the existence of a higher power, but the mercy of the true faith was denied them. They had not known Christ.

It is in this field of tension between revealed and natural theology that such metaphors as *theatrum mundi*, *speculum* and *liber naturae* flourished. These metaphors focused attention on the non-Biblical sources of knowledge about God, which were in principle visible to all mortals. The world, after all, was conceived as a huge single work of art, so that it was assumed that there was (or had been) an artist, creator or maker. These concepts worked in two ways. On the one hand they confirmed the faith of the Christians by pointing to the hand of God in the Creation. On the other hand they fulfilled an emphatic apologetic function: even those who do not know the Word of God can recognise his providence in the direction of heaven and earth, 'so that they are without excuse', as Paul had put it.³⁸ This theme is a thread that runs through the history of Christianity.³⁹

The miracle of the Creation was already deployed by the church fathers to convince heretics and the unbelieving. Augustine's *De Genesi contra Manichaeos* (ca. 387 AD), for example, is a defence of divine providence in the Creation aimed against the sect of the Manicheans.⁴⁰ In this connection the bishop of Hippo also formulated the conviction

³⁶ *Ibid.* II, xxxiv.

³⁷ See for example: Le Maire, Vivum theatrum, 86–89.

³⁸ Romans 1:20.

³⁹ Philipp, *Aufklärung*; Dulles, *History of Apologetics*; Krolzik, *Providentia-Dei-Lehre*; Groh, 'Emergence of Creation Theology'.

⁴⁰ Walter, *Das hermeneutische Problem bei Augustin*; Howell, 'Natural Knowledge and Textual Meaning'; Drecoll, 'Quasi legens magnum quondam librum naturae rerum'.

of the double revelation of God: the first is the Bible, which the literate can read, the second is the world, which can be read and understood by the illiterate (*idiota*) as well.⁴¹ The Bible and nature are here both seen as sources of knowledge about God.

Augustine expounded the theory of the two books in a polemical context and did not elaborate it as a clearly defined doctrine. In the Middle Ages, the notion of the Book of Nature occurs repeatedly in a variety of contexts.⁴² Entirely in the Augustinian tradition, for example, is Hugo of St Victor (1096–1141). Referring to Paul's *Epistle to the Romans* 1:20, he argued at length that the visible world 'is like a book, written by the finger of God, in other words, created by divine power'.⁴³ A passage from Alanis de Insulis (1120–1202) was also often cited:

Omnis mundi creatura, quasi liber, et pictura Nobis est, et speculum.⁴⁴

The latter citation in particular shows that the metaphors applied to God's Creation were to a certain extent interchangeable. Mirror, book, image or theatre all have in common that they are visual metaphors. They permit man to see something of God's almightiness beside the Biblical revelation. One has the impression, however, that the *liber* naturae metaphor was particularly popular in theological circles. The liber naturae did not function on its own in the Augustinian tradition, but was embedded in a theory—which was not elaborated systematically—of two Books of God. Without spiritual knowledge of God's Word, mortals who contemplated the Book of Nature were like illiterates: they could only see signs without being able to recognise them as letters. By placing too much emphasis on the Book of Nature, the subtle dividing line between natural and revealed theology was crossed, opening the way to animism, pantheism and even atheism. It was a danger that was inherent in the doctrine of the two books, and which would rear its head now and then in early modern Europe.

⁴¹ Augustine, Enarratio in Psalmum XLV, 7.

⁴² Curtius, *Europäische Literatur*, 323–328; Nobis, 'Buch der Natur'; Cizewski, 'Reading the World as Scripture'.

Hugo of St Victor, De tribus diebus IV, MPL 176, 2.

⁴⁴ Alanis de Insulis, *De incarnatione Christi*, MPL 210, 579.

The heritage of the Reformation

Scrutiny of the studies that have been made of the use of the metaphor of the Book of Nature shows not only that it was regularly to be found in the Middle Ages, but also that it became particularly popular in the Protestantism of the sixteenth and seventeenth centuries.⁴⁵ Whether these studies provide a representative picture of the whole European intellectual culture is a question that has to be left unanswered here from lack of a comprehensive synthesis, but one has the impression that the Reformation offered a fertile soil for the *liber naturae*, just as physico-theology was a pre-eminently Protestant phenomenon in the eighteenth century.⁴⁶ We can only speculate about the reasons for this.

It is quite likely that the theological accent shifted from God's supernatural works to the more natural ones as a result of the Protestant attack on the Catholic belief in miracles.⁴⁷ This process was prior to the seventeenth-century concept of 'natural law' as formulated by Descartes.⁴⁸ It was precisely the apparently normal but in fact equally miraculous course of things that betrayed his providence and majesty, Protestant scholars claimed in the wake of Augustine.⁴⁹ Did not the order maintained by God in nature offer a much deeper source of certainty than all the dubious stories about miracle-working saints, healing relics and holy places? According to a not very strictly defined Protestant doctrine, there had been no more miracles since the establishment of the church in the apostolic era. 'For why should they occur now that the doctrine is secure and established?', Luther asked.⁵⁰ The Protestants had no need of contemporary miracles, Calvin claimed: 'For we are not forging some new gospel, but are retaining that very gospel whose truth all the miracles that Jesus Christ and his disciples ever wrought serve to confirm'. 51 Only the biblical miracles were authentic.

⁴⁵ Cf. Curtius, *Europäische Literatur*, 306–352; Rothacker, *Buch der Natur*; Harrison, 'Book of Nature'; Howell, 'Hermeneutics of Nature and Scripture'; Methuen, 'Interpreting the Books of Nature and Scripture'.

⁴⁶ Philipp, Aufklärung; Bots, Tussen Descartes en Darwin; Harrison, The Bible, 64–160.

⁴⁷ Cf. Walker, 'Cessation of Miracles'; Daston, 'Wunder', 110.

⁴⁸ Vermij, 'Een nieuw concept'; Harrison, 'Miracles and the Laws of Nature'; Joy, 'Scientific Explanation'.

⁴⁹ Cf. Augustine, De civitate Dei XXI, 5-8.

⁵⁰ Luther, 'Predigt am Sontag Septuagesima, 24. januar 1535', WA 41, 20.

⁵¹ Calvin, *Institutes*, 'Prefatory adress to King Francis'.

Of course, God was capable at all times of intervening supernaturally, but in fact there had been no reason for him to do so since the age of the apostles. If a doubting mind required proof of God's almightiness outside the Bible, he should first take into consideration the so often neglected order to be found in nature. All so-called miracles from the post-apostolic period are in principle ascribed to corrupt papism or the activity of Satan, which were virtually identical in the eyes of the Protestants.⁵² The emphasis thus shifted towards what everyone could see: the course of the heavens, the succession of the seasons, and the anatomy of the human body. Was not each of these a natural wonder and a sign of God's almightiness? Time-hallowed qualifications of God as *Architectus*, *Artifex* (craftsman) or *Auctor* (originator) were especially popular in Protestant circles.

A second major difference from Catholicism was that the Protestants placed a great deal of emphasis on the textual tradition, particularly the Bible. In the Catholic tradition the reading and exegesis of the Bible was an activity reserved for the clergy. The sola scriptura became one of the key concepts of the Reformation. Protestantism was the religion of the word. The authority of the Latin translation of the Bible, the Vulgate, was rejected by the Protestants, and so was the monopoly of its exegesis claimed by the Catholic church.⁵³ The Protestants regarded Christianity as a religion whose essence lay in the biblical canon, but whose interpretation had been systematically withheld or distorted by the papists. This new hermeneutic principle had enormous consequences. The basis of religion was moved from the tradition accumulated within the church to the private individual's relation with the Bible. The Holy Scripture was transformed from a closed to an open book.⁵⁴ The Word of God was retranslated and printed; it was read, digested and discussed by the faithful. The invention of printing played a tremendous role in this process.⁵⁵ Not only the Bible, but also numerous texts by classical writers, the church fathers, monks and lay authors who wrote about God's hand in the Creation were now accessible to a wider group of readers. The Bible

⁵² Dutch professors of theology repeated this idea: Gomarus, *Opera theologica omnia* III, 205–206; Idem, *De schildt der waerheyt*, 129–137; Walaeus, *Opera omnia* I, 151; Le Maire, *Vivum theatrum*, 309–310.

⁵³ Moeller, 'Scripture, Tradition and Sacrament'; McGrath, Intellectual Origins, 152-274

⁵⁴ Norton, History of the Bible I, 53.

⁵⁵ Eisenstein, *Printing Press*, 303–452.

was printed in vast editions in the Protestant regions, and came into the hands of many interested individuals. This textual orientation, the possibility of reading, understanding and reciting the biblical text by and for oneself, probably created a fertile soil for the metaphor of the book. The Book of Nature was linked to and sanctioned by the Book of Books. That connection probably appealed more than the purely worldly metaphors of the mirror or the theatre in Protestant circles.

To pass from speculation to fact, reflections on God's revelation in the Creation played an important role in the thought of the three protagonists of the Reformation: Luther, Melanchthon and Calvin. The two latter wrote systematic works on the subject and often resorted in this context to the metaphors of theatre, book, and the divine *Auctor* or *Architectus*. The basis was provided by biblical passages and by Augustine and the Stoics. Although there are differences of emphasis in the way in which Melanchthon and Calvin appreciated human reason, they both stressed that without the mercy of the faith and the divine word it was impossible to attain true knowledge of God.

A figure who was particularly influential in the Dutch Republic too was Philip Melanchthon (1497–1560).⁵⁶ He often used expressions based on the assumption that nature was legible—on the basis of the Bible, of course. The whole of nature bore traces or signs of God (*vestigia Dei*).⁵⁷ God wanted people to contemplate these signs and to recognise their Creator or Originator in them. However, human reason had been dimmed by the Fall, so that these signs were no longer self-evident:

[Only] when the spirit is strengthened by the true and right conviction of God, and of the Creation through the Word of God itself, is it both useful and pleasant to seek the signs of God in nature too and to collect arguments that confirm that God exists.⁵⁸

The study of the separate phenomena is only meaningful when conducted within a biblical framework. God's providence in the Creation

⁵⁶ Kusukawa, *Transformation of Natural Philosophy*; Leonhardt ed., *Melanchthon und das Lehrbuch*. On the influence of Melanchthon in the Dutch Republic see: Platt, *Reformed Thought*, 10–33; Scheible ed., *Melanchthon in seinen Schülern*.

⁵⁷ CR 15, 565.

⁵⁸ CR 21, 369.

could be seen thanks to physics, mathematics, astronomy, botany and medicine.⁵⁹

John Calvin (1509-1564) saw things in the same way.⁶⁰ His views left an indelible mark on the Belydenisse des gheloofs, and thereby on Dutch thinking about the Book of Nature. There is a direct link between Calvin and the original text of the Belydenisse, the Confession de foy (1561) of Guy de Brès, and it seems that the Genevan reformer personally approved the original text. 61 A crucial theme in Calvin's thought is the glory of God in nature.⁶² Calvin is in this respect indebted to Augustine and Cicero. In the *Institutio* and in his exegetical works he proclaims the time-hallowed conviction that the entire Creation is evidence of the almightiness of God. The book of Genesis describes how in the beginning God created heaven and earth. But after those six days of work he is still active. Without God's constant care and presence the Creation would immediately lapse into chaos. Calvin thus explicitly opposes those philosophers who dream of an idle and inactive God as well as fulminating against Epicurus, who taught that the world consists of a random concatenation of atoms of matter. 63 The world is not a mechanism, nor is it ruled by blind forces. God is not outside nature, but neither is he identical with nature, Calvin argues in his polemic with the Stoics.⁶⁴ Everything is the consequence of his will. If the earth is moistened by rain and dew, that is an expression of his favour and mercy; if the fields are parched and the harvests ruined, that is a sign of his indubitable and particular wrath.⁶⁵

According to Calvin, man and the universe were created in honour of the Lord. Man should 'turn his eyes to contemplate God's works, since he had been placed in this most glorious theatre to be a spectator of them'.⁶⁶ Against this background the theologian often describes the cosmos as 'a beautiful work of art', a 'mirror' or a 'theatre'. God's essence is unfathomable, so that his godhead cannot be perceived

⁵⁹ Westman, 'The Melanchthon Circle'; Nutton, 'Wittenberg Anatomy'; Methuen, 'Role of the Heavens'.

Role of the Heavens'.

60 Bouwsma, *John Calvin*; Oberman, *Initia Calvini*; Steinmetz, *Calvin in Context*.

⁶¹ Bakhuizen van den Brink, *Belijdenisgeschriften*, 1–28; Platt, *Reformed Thought*, 104–119.

⁶² Steinmetz, 'Calvin and the Natural Knowledge of God'; Schreiner, *Theatre of His Glory*.

⁶³ Calvin, Institutes, I, XVI, 4; I, V, 4.

⁶⁴ See, for example: *Ibid.* I, V, 12.

⁶⁵ *Ibid.* I, XVI, 5.

⁶⁶ Ibid. I, VI, 2.

by any of the human senses. But in each of his separate works God has inscribed indubitable signs of his glory. These signs are visible to all, even the heathen, and are to a certain extent even legible. In line with the Christian tradition, Calvin remarks that the Creation is a 'lay book'.⁶⁷

Referring to Cicero, Calvin states that there is no tribe so savage as not to share the conviction that there is a God.⁶⁸ His existence can be deduced from what he has created, but as a result of their corrupt condition, people are no longer able to understand who he is.

Just as old or bleary-eyed men and those with weak vision, if you thrust before them a most beautiful volume, even if they recognize it to be some sort of writing, yet can scarcely construe two words, but with the aid of spectacles will begin to read distinctly.⁶⁹

To enlighten mankind, largely blinded as it is through the Fall, God has spoken via Moses, and given mankind his Word. The Bible is like a pair of spectacles that enables us to know God. Calvin explains this in more detail in the *Institutio* and in his commentary on *Genesis*:

For if the mute instruction of the heaven and the earth were sufficient, the teaching of Moses would have been superfluous. This herald is therefore added to nature to draw our attention, in order that we may perceive ourselves to be placed in this theatre for the purpose of beholding the glory of God.⁷⁰

The contemplation of the Book of Nature is a first step towards the Lord; this removes our innocence and ignorance and draws our attention to his existence. The next and decisive step is to read the Bible, 'whereby God is known not only as the Founder of the Universe and the sole Author and Ruler of all that is made, but also in the person of the Mediator as the Redeemer'. The Holy Scripture is like a pair of spectacles that dispels the otherwise confused and imprecise notions of God and clearly shows us the true God. Only through the Bible can we really get to know God's mercy and revelation.

⁶⁷ Calvin, Commentarius in Genesin, CR 51, 18.

⁶⁸ Calvin, Institutes I, III, 1; Cf. Cicero, De natura deorum I, xvi.

⁶⁹ Calvin, Institutes I, VI, 1; Cf. Idem., Commentarius in Genesin, CR 51, 2.

⁷⁰ Calvin, Commentarius in Genesin, CR 51, 10, Cf. Institutes I, XIV, 1-2; I, X, 1.

⁷¹ Calvin, Institutes I, VI, 1.

⁷² *Ibid.* I, VI, 1; I, XVI, 1.

⁷³ *Ibid.* I, VI, 3.

The Book of Nature in Dutch religious writings

There is a direct link from the Bible, via Augustine and Calvin, to article II of the *Belydenisse des gheloofs* (or Belgian Confession, as it is better known) and the Reformed spiritual culture in the Netherlands. Knowledge of God is possible through the Bible and the Book of Nature. But no matter how important the latter was, the Word of God always has priority. It taught, according to the orthodox Calvinists, not only that God exists and still directs affairs on earth through his providence, but also who he is. Genuinely Christian reflections on the Book of Nature presupposed biblical knowledge or, as Calvin put it, the spectacles of the Bible.

The Belgian Confession, the Heidelberg catechism and the doctrinal regulations of the Synod of Dordrecht were to form the doctrinal foundation of Reformed orthodoxy in the Dutch Republic from 1619 on. The way in which the *Belydenisse* was introduced in the decades after its first Dutch edition (1561) need not concern us here.⁷⁴ The same applies to the way in which Calvinism spread in the Netherlands from the outbreak of the Dutch Revolt.⁷⁵ Two points, however, call for attention here.

The first is that, in spite of the fact that the Reformation in the Netherlands was a gradual process, and in spite of the fact that the Calvinists formed a—self-chosen—minority in their country, the 'true Christian religion' made a deep impression on intellectual life. Any applicant for a public position was required to subscribe to Reformed doctrine. Calvinism was propagated by the church, school and university.

The second point is that the view codified in the *Belydenisse des gheloofs* according to which the Creation was like a second Book of God was not a doctrine imposed from above, but a manifestation of much older and deeply embedded ideas. Article II is in fact little more than a testimony to a particular moment, and not the starting point of a new tradition. In spite of the different ways in which Reformed doctrine might be accepted and interpreted by each individual, the conviction that the finger of God could be recognised in his Creation was shared by a sizeable group of Dutch Protestants. Scholars knew

⁷⁴ Bakhuizen van den Brink, *Belijdenisgeschriften*, 1–27; Platt, *Reformed Thought*, 104–118

⁷⁵ Duke, Reformation and Revolt in the Low Countries; Kaplan, Calvinists and Libertines; Pollmann, Religious Choice; Israel, Dutch Republic, 179–232, 361–398.

the classics. From the start of the Dutch Revolt, ministers, professors and other teachers talked about the Book of Nature, while poets eulogised it in their verses. This discourse can be reconstructed from a variety of sources.

First of all, the Confession de foy was not the only French-language text to exert a great influence on thinking about the Book of Nature in the Netherlands. Two Huguenot writings also contributed to it: Du Plessis-Mornay's De la vérité de la religion chrestienne (1581) and Du Bartas' *La sepmaine* (1578). The famous diplomat Philippe de Mornay, Seigneur du Plessis-Marly (1549-1623) defended, entirely in the spirit of Calvin, the existence of the one almighty God against Epicureans, atheists and the other 'infidels'.76 Du Plessis used a tried and tested resource: he referred to God's works in the Creation. His argument was longwinded and hardly original (besides all the relevant biblical citations he also rehearsed all the traditional arguments of natural theology), but all the same, or perhaps for that very reason, the work was an enormous success. It was held in high esteem in the Netherlands and was the most widely read defence of Protestant Christianity until the publication of Grotius' De veritate religionis christianae in 1627.77 Moreover, a Dutch translation of Du Plessis-Mornay's work by the Amsterdam minister Johannes Halsbergius (1560–1607) and dedicated to the Dutch parliament (the States-General) appeared in 1602.⁷⁸

It is interesting that Halsbergius reinforced the message of the work by giving it a more resonant title: *Bybel der Nature, dat is, van de waerheyt der Christelycke religie* (Bible of Nature, that is, of the truth of the Christian religion). In his preface the translator referred to the *Belydenisse des gheloofs*. There are two sources of knowledge of God, he wrote: 'one is general, the other particular, via the Word of God'. The general source, 'the contemplation of created things', was the subject of this splendid work by the very learned Du Plessis:

For the heaven, the sky, the earth and the sea call out loudly everywhere that there is one God, who rules all things, as he once created them from

⁷⁶ Du Plessis Mornay, *De la vérité de la religion chrestienne*; Cf. Fatio, 'La vérité menacée'.

⁷⁷ Grotius, De veritate religionis christianae; Heering, Grotius as Apologist.

⁷⁸ Bybel der Nature, dat is, van de waerheyt der Christelycke religie. The book was reprinted in 1626 and 1645.

nothing but his will. For what is the whole world but a big book in which one contemplates and reads God's glory?⁷⁹

The Fall, Halbergius continued, had indeed put an end to the comprehensive knowledge of men, but it was still possible for every mortal to catch at least a glimpse of God's almightiness. The frontispiece of the second edition (1626) speaks volumes: it shows Adam and Eve before the Fall amid the wonders of nature. Thanks to the Book of God, their descendants would be able to come closer again to the original knowledge of God.

At least as important as *La vérité* was the work of another Huguenot diplomat, Guillaume de Salluste, Seigneur du Bartas (1544–1590).80 Du Bartas achieved lasting fame with his poem La sepmaine ou la création du monde (1578) on the six days of the Creation. Based on the first chapter of Genesis, Du Bartas created a poetic and didactic model for an understanding of the Creation. Every facet of the six days refers to the love and almightiness of 'the worker of workers' and provides an undeniable proof of his existence.81 In this context the writer made frequent use of comparisons with a long history such as 'ceste ronde machine', 'un theatre', and of course 'un grand livre'.82 The French work was very influential in terms of both form and theme on the art of poetry in the young Dutch Republic.83 It is echoed in Huygens' Hofwijck and Cats' Buytenleven. Various Dutch-language versions of (parts of) the poem appeared, the best-known being that by Zacharias Hevns (1616). Du Bartas too claimed that nature was the Book of God from which even the illiterate could deduce that he exists. Nevertheless, the grace of the faith and knowledge of the Old and New Testament are necessary for true knowledge of God.84

That this interpretation of the *liber naturae* circulated throughout the Netherlands can also be seen from the theological writings that rolled from the press from the 1580s on. Thinking, talking and writing about the Book of Nature was no longer a question of *emulatio* and *imitatio* of earlier foreign literature, but was to become a regular

⁷⁹ Bybel der Nature, dedication, (2).

⁸⁰ Dauphiné, Guilaume de Salluste du Bartas.

⁸¹ Saluste du Bartas, La sepmaine I, 3.

⁸² *Ibid.* I, 7-8.

⁸³ Beekman, Influence de Du Bartas; Leerintveld, 'Huygens vertaalt Du Bartas'.

⁸⁴ De weke vanden Edelen Gheest-rijcken Willem van Saluste. Vertaelt door Zacherias Heyns. Cf. La Sepmaine I, 8–10.

theme in a flood of Dutch publications. Besides the popularity of the book metaphor, these works also show the differences of interpretation and potential conflicts to which this topic could lead. The Bible and the Book of Nature had been regarded since Augustine as sources of knowledge of God, it is true, but the precise relation between them offered plenty of scope for debate. Which hermeneutic techniques were permitted? What was the relation between revealed and natural theology? The writings of Calvin, Article II of the Belgian Confession and the works of Du Plessis and Du Bartas did not provide any clear indications on this score, but were rather different formulations of views that went back to the Pauline *Epistle to the Romans*.

The strength of the book metaphor lay in its versatility or vagueness. Is the book not on the one hand the symbol of absolute certainty, and on the other hand of the *individual* reading and interpretation? The theory of the two books offered a wide interpretative framework. Just as there was debate on the exegesis of passages from the Bible, so could differences of opinion arise on the form and content of the Book of Nature, and on the relation between the two books. These were problems that were already latent during the early days of the Reformation in the Netherlands, and which were to become manifest in the course of the seventeenth century as a result of a number of factors.

In spite of the fact that the Belgian Confession exerted an influence from 1561 on, no commentary was published on it until 1652. Another foundation of Reformed orthodoxy, however, the Heidelberg catechism, was immediately followed by a growing body of exegesis which is also relevant in the present context. The catechism was drawn up in 1563 by Melanchthon's pupil Zacharias Ursinus (1534–1583) and Caspar Olevianus (1536–1587). The Dutch translation led to its introduction as a textbook in schools and churches in the Netherlands around 1566. A total of 129 questions and answers were dealt with on the fifty-two Sundays of the year. None of the questions in the catechism touches directly on the question of the proofs of the existence of God, and there is thus no mention of the Book of Nature.

⁸⁵ The first commentary was: Maresius, *Foederatum Belgium orthodoxum*; see Platt, *Reformed Thought*, 114–118; 192–194.

⁸⁶ Visser, 'Zacherias Ursinus'.

 $^{^{87}}$ Bakhuizen van den Brink, Nederlandse belijdenisgeschriften, 29–40; Platt, Reformed Thought, 49–103.



Fig. 6. Engraving, representing the fifth Day of Creation, taken from the Dutch translation of Du Bartas' *Sepmaine* (KB).

However, questions 25, 26, 27 and 28 explicitly refer to God the Creator and his providence. It is in connection with these passages that Dutch commentators sometimes went in detail into how one could recognise the Creator in nature. In the first known commentary on the catechism, written by the minister Cornelis Corstens (d.1598), the tone was immediately set. In his commentary on Question 25 ('that there is but a single divine being') Corstens wrote:

As regards God's unity, that is well testified for us from the creation of all creatures. Because in this all visible creatures are like letters in a beautiful book to show us their creator.⁸⁸

Later commentators repeated the theme. 89 Contemplation of the creatures is not an activity for its own sake, but is only meaningful with the aid of the Holy Scripture. Only the Bible could make the separate letters comprehensible in a genuinely Christian context.

A good illustration of this attitude can be found in the figure of Philips Lansbergen (1561–1632), an astronomer and minister from the province of Zeeland. Lansbergen's name was known all over Europe for the writings in which he defended Copernicus between 1619 and 1631.90 Lansbergen, whose astronomical works were praised by Voetius and Cats as contributions to religious piety, is an important figure in this connection. He is an exponent of an interesting group of Dutch ministers who were partly motivated by religious considerations to engage in research on the natural world. This group included his friend Abraham van der Mijle, the latter's son-in-law Andreas Colvius, as well as Petrus Plancius and Johannes de Mey. Lansbergen was also a friend of the minister, poet and botanist Petrus Hondius (1578–1621).91 Lansbergen studied theology and mathematics in Leiden. He revealed himself to be a fervent Calvinist and was called to be minister in Goes. His only primarily theological work, an exegesis of the Heidelberg catechism, was published in 1594.92 The book was well received in orthodox circles, went through several editions, and was translated into

⁸⁸ Corstens, Wtlegghinge des catechismi, 50/r.

⁸⁹ Bastingius, Verclaringe op den catechisme, 50–65; Acronius, Enarationes catecheticae, 40–47.

⁹⁰ Vermij, Calvinist Copernicans, 73-99.

⁹¹ Meerkamp van Embden, 'Petrus Hondius'.

⁹² Lansbergen, Catechesis religionis Christianae.

the vernacular in 1616.93 The work naturally dealt with the questions bearing on divine providence. The learned author patiently explained that it was to be seen very clearly from the order of the cosmos: 'For how could such a large and heavy edifice and so many hanging bodies exist if God himself did not support it with the word of his strength?'94 Lansbergen also cited the succession of the seasons, vegetation and grass, wet and dry periods.95 'God who directs all things not only carefully but also with such wisdom that we are unable to comprehend it with our understanding'. 96 But no matter how much one marvelled at the creation, it was first necessary to get to know its properties from the Word, 'for we must know that foundation, without which God himself cannot be known or praised by us'. 97 Lansbergen's exegesis shows that his own starting point was the Book of Books. Although he was a talented astronomer, he did not refer to his own observations or calculations. His sermons are riddled with references to the books of Genesis, Job and the Psalms. He reasoned from the Bible to nature, not the other way around.

The same approach is also characteristic of Lansbergen's astronomical works, which often took their motto from *Psalm* 19:1 ('The heavens declare the glory of God'). This was no hollow reference, but Lansbergen's scientific premise. As he noted, for example, in his *Verclaringhe van 't ghebruyck des astronomischen quadrants* (Explanation of the use of the astronomical quadrant, 1620):

For if we are content to gaze upon the stars without paying heed to God's ordinance, we shall be like the brute beasts who see the stars every day as we do, without making higher use of them.⁹⁸

Without God's revelation, the inquirer into nature would soon lapse into heathendom, Lansbergen considered. That biblical anchoring is also explicit in Lansbergen's famous defence of the Copernican system, Bedenckinghen, op den daghelijcksen, ende iaerlijcksen loop vanden aerdt-cloot (Reflections on the diurnal and annual course of the

⁹³ Lansbergen, *Catechismus ofte onderwijsinghe* (1616, I consulted the third edition, Amsterdam 1645).

⁹⁴ Lansbergen, Catechismus, 67-68. See also Ibid., 395-396.

⁹⁵ *Ibid.*, 69–71.

⁹⁶ Ibid., 394.

⁹⁷ Ibid., 394-395.

⁹⁸ Lansbergen, Verclaringhe van 't gebruyck, 18.



Fig. 7. Frontispiece of Philip Lansbergen's Manual on the Astrolabe (1628). The quotation is from *Psalm* 36:5: 'Thy mercy, O LORD, is in the heavens' (KB).

earth, 1629).⁹⁹ It is tempting to regard this treatise—one of the first public defences of heliocentrism in Europe—as a triumph of modern science. That would be wrong: it was the author's biblical orientation that formed the background of his Copernicanism.¹⁰⁰ Lansbergen's cosmology was to a large extent based on a rather idiosyncratic exegesis of the Holy Scripture, such as of the Pauline *1 Timothy* 6:16 ('Who only hath immortality, dwelling in the light which no man can approach unto').

Lansbergen's work illustrates how fluid the line could be between revealed and natural theology, between the Word of God and the Book of Nature. Lansbergen's premise was the former. However, the precise relations between the proofs of God from the Book of Nature and those from the Book of Grace in the Dutch exegeses of the catechism varied from one author to another, and became more pronounced as the doctrines of the Reformed Church crystallised in the decades between the outbreak of the Dutch Revolt and the Synod of Dordrecht. The relation between Sacra scriptura and liber naturae was regarded as complementary by practically every theologian who expressed his views on the subject, but the precise relation between natural and revealed theology acquired a problematic status against the background of so-called Bestandstwisten, the notorious controversy between Arminians (or Remonstrants) and Gomarists (or Counter-Remonstrants) from 1609 to 1621. 101 The Counter-Remonstrants proceeded in the first instance from the grace of faith, and from biblical passages which mentioned God's active involvement in the Creation. They regarded the evidence from the Book of Nature as supplementary, while they accused their opponents of following the opposite course. Indeed, in 1605 Caspar Barlaeus, who entertained distinctly Arminian sympathies, made a lyrical defence of natural theology and the Book of Nature, in which everyone could 'read' God (Deum legere). 102 The influential Arminian theologian Simon Episcopius (1583–1643) regarded the human spirit as a tabula rasa, thus without innate notions of God, so that almost the entire weight came to lie on external proofs of God, namely the

⁹⁹ Lansbergen, Bedenckingen, op den dagelijcksen, ende iaerlijcksen loop vanden aerdt-cloot.

¹⁰⁰ Vermij, Calvinist Copernicans, 73-99.

¹⁰¹ Israel, Dutch Republic, 421-476; Platt, Reformed Thought, 179-238.

¹⁰² Barlaeus, De cognitione Dei.

Book of Nature. 103 This was going too far, his opponents argued: the step to pantheism and Socinianism was dangerously close, if it had not already been taken. The details of this very complicated debate, however, need not detain us here. 104

Two points should be emphasised in this connection. First, the question of the status of the Book of Nature formed an integral part of the religious discourse in the Dutch Republic at the end of the sixteenth and the beginning of the seventeenth century, and thereby formed a part of the general intellectual culture. The discussion was entirely centred on the relation between liber naturae and liber scripturae. There is absolutely no sign of an alternative approach to the Book of Nature in the spirit of, say, Paracelsus or Galileo. Second, even after the Synod of Dordrecht had settled the dispute between the Remonstrants and the Counter-Remonstrants and in favour of the latter, the discussion of the interpretation of the Book of Nature continued. In the short term the strong emphasis that the Arminians placed on natural theology may have put them on the defensive, but in the longer term this position was to regain influence. There is without any doubt a line of continuity stretching from the Arminian design argument to eighteenth-century physico-theology. 105

However, the Counter-Remonstrants also reflected on the Book of Nature. In thorough treatises they emphasised that the existence of God could be *partly* deduced from the order and maintenance of the Creation, and that the heathen had no excuse. Pagan philosophers and the Bible provided the decisive arguments for this position. The highly orthodox theologian Festus Hommius (1576–1642), for instance, wrote in his popular *Schatboeck der Christelicke Leere* (Treasury of Christian Doctrine, 1602):

That there is one God. This is not only so abundantly taught in God's word that it is impossible to turn a leaf without finding manifold witnesses to it, but it is by nature so planted and imprinted in all the hearts of men that there is no people or nation, however barbarian it may be, that does not know that there is one God. *Aristoteles lib. de coelo. text* 22. Cicero lib. 2. de Leg et 1. Tusc. q. Seneca Epist. 21 et 118. This is also

105 Platt, Reformed Thought, 241.

¹⁰³ Episcopius, Opera theologica I, 6–7.

Platt, Reformed Thought, 49-241; Krop, 'Natural Knowledge of God'.

testified by the works of God such as the creation, maintenance and direction of all creatures in general and of man in particular *Rom.1.20.*¹⁰⁶

Anyone who opened the voluminous *Opera Theologica* of Gomarus could read that the world is not only a master, witness and herald for us, but also:

A book, a mirror, a theatre in which, almost tangibly, his favours to us, and our obligations to him, can be read. (*Rom. 1:20; Matt. 6:26; Proverbs 6:6; 1 Cor. 1:21; Acts 17:27*).¹⁰⁷

However, Gomarus emphasised, the contemplation of the Creation should be done on the basis of the Word of God.¹⁰⁸

Partly as a result of the Protestant logocentrism and the contemporary writings of theologians and poets, generations of Dutch believers became familiar with the idea that nature was a second Book of God. Article II of the Belgian Confession was a manifestation of older and more deeply rooted ideas, not a decree imposed from above. For scholars, both theologians and natural philosophers, the Bible was the perspective from which the Creation was viewed, understood and described. Besides the strong emphasis on revealed theology, Dutch theologians left room for natural theology. It is no coincidence that orthodox circles often referred to God's Creation as a theatrum, speculum or liber, although the latter was by far the most popular. The more secular metaphors of the theatre and the mirror also referred to God's Creation, but the advantage of the Book of Nature was that it contained the key to its own decipherment. Without the Word, it was possible to deduce that there was a God, but not who he was. For instance, an orthodox minister wrote in 1634: 'That is why the good God chooses to give us the Book of Scripture as an aid to the Book of Nature, as an interpreter or translator of the same, the one explaining the other'. 109 Or, as the Groningen professor of theology Samuel Maresius (1599–1673) summed it up in the first commentary on the Belgian Confession (1652):

¹⁰⁶ Hommius, *Schatboeck der Christelicke leere* (1602, I consulted the edition of 1638), 86/v.

¹⁰⁷ Gomarus, Opera Theologica III, 2. See also: Synopsis purioris theologiae...ac conscripta per Johannem Polyandrum, Andream Rivetum, Antonium Walaeum, Antonium Thysium, 63.

¹⁰⁸ Gomarus, *Opera theologica* II, 10–11; Van Itterzon, *Franciscus Gomarus*, 49–55. ¹⁰⁹ Spranckhuysen, *Macro-cosmus*, 5.

The Book of Nature teaches *that* God is and the Scripture teaches *who* he is; the former shows the almighty power and wisdom of God, the latter reveals the rich treasures of divine goodness and mercy in Christ.¹¹⁰

In the context in which orthodox Dutch scholars used the term, the Book of Nature did not function on its own, but presupposed the Word of God. This was probably one of the reasons for the attractiveness of this metaphor. Like any other text, the Book of Nature could be understood in diverse ways, but in principle the Reformist orthodoxy held that the letter of the Bible dictated how it should be read. The description of God's Creation as a beautiful book in which all creatures are 'like letters' thus not only fitted perfectly into the Protestant reliance on the Bible, but also neutralised the potentially dangerous effect of natural theology. After all, without biblical sanction, reflection on nature could lead only too soon to pantheism, materialism and even atheism. In 1662 Maresius reluctantly had to join battle with a sectarian who appealed to the liber naturae to support the view that the conjunction of all planets calculated for 1664 announced the end of the world. Such a reading, Maresius considered, was pure heresy and entirely in contradiction to God's Word.111

The interpretation of God's 'two Books' and the relation between them was also the subject of a lively debate that was conducted in a broad circle. How the two books and the relation between them were interpreted varied from person to person, and also shifted as a result of the stormy seventeenth-century developments in the field of natural philosophy and biblical hermeneutics. But the Book of Nature should be interpreted in the first instance on the basis of the Holy Scripture, orthodox theologians claimed. This brings us to the question of whether, and if so, how this fairly abstract understanding of the question of the *liber naturae* was translated in reflections on the divine Creation.

The liber naturae between theology and philology

That nature should be regarded as a book was not only an influential metaphysical idea but also a more practical given in learned circles around 1600. Knowledge, *scientia*, was primarily the result of studying

¹¹⁰ Maresius, Confessionis exegesis, 61-62.

¹¹¹ Van der Wall, Petrus Serrarius, 316-337.

ancient texts.¹¹² The Word of God provided the broader framework within which the classical writings were received and understood. This applied to every discipline. Anyone who devoted himself to natural science in this period started by shutting himself up in a library, so we must understand the metaphor of nature as text also very literally in this period.

The *liber naturae* was first studied around 1600 with the instruments of humanism. Knowledge of Latin, Greek and preferably Hebrew too; the reading of texts and commentaries—that was what mattered most. The ancient Israelites, Greeks and Romans were regarded as direct conversation partners, and their writings as an arsenal of timeless and universal wisdom. It should be emphasised that the natural sciences played a subordinate role in the universities of the day. The highest discipline was theology, followed by law and medicine. Most of the students with an interest in the natural sciences chose medicine (with the subdisciplines of anatomy and botany). At the bottom of the academic hierarchy was the preliminary *artes* faculty which taught Greek, logic, physics, mathematics, astronomy and other subjects.¹¹³ As Harold Cook has pointed out, many Dutch inquirers into nature and philosophers of nature were trained in medicine after a preliminary training in the *artes* faculty.¹¹⁴

An important contribution to the biblical and classical orientation was the sacred conviction that all knowledge had already been revealed in the past during the Creation. This was the moment, as Calvin expressed it, of the 'speechless teaching of heaven and earth'. Adam's comprehensive knowledge of God (and thereby of nature) was lost in the Fall, it was generally believed, but much of it had still been known to the Chaldeans, Babylonians and Egyptians. Renaissance scholars spoke respectfully of the *prisca theologia*, *prisca sapientia* or

¹¹² Schmidt-Biggemann, *Topica Universalis*; Crombie, 'Science and the Arts'; Pumfrey, 'The History of Science and the Renaissance Science of History'; Blair and Grafton, 'Reassessing Humanism and Science'; Grafton, *Defenders of the Text*; Idem, *Commerce with the Classics*; Johns, *Nature of the Book*.

¹¹³ Dibon, L'enseignement philosophique; Galama, Het wijsgerig onderwijs; Krop, Van Ruler and Vanderjagt eds, Zeer kundige professoren; Van Miert, Humanism in an Age of Science.

¹¹⁴ Cook, 'Cutting Edge'; Idem, 'Natural History'; Idem, *Matters of Exchange*, 82–226, 304–377 and passim.

¹¹⁵ Calvin, Commentarius in Genesin, CR 51, 10.

sapientia veterum: the wisdom of the ancients that had been lost. The divinely inspired books of Moses also contained *physical* knowledge. 116

This had been partly known to the Egyptians, who had recorded it in enigmatic hieroglyphs. The Greeks and Romans who succeeded them had recorded that knowledge, albeit considerably corrupted by then, in heavy tomes, most of which had disappeared from sight during the Dark Ages. Thanks to the activities of the humanists that got under way in the fifteenth century, these texts had resurfaced and it had become possible to return to the knowledge of the past. 'Whatever the object of their study', Giard notes, 'they all pursued the impossible dream of reconstituting the Ur-text'. 117 This background also explains the sixteenth-century fascination with etymology, Hebrew, Chaldean and the (as yet undeciphered) hieroglyphs. The closer one came to Moses and Adam, the closer it brought one to the Word of God. This conviction was one of the foundations of the very lively debate on God's second Book. 'Since the Adamic language embodied Adam's true and perfect knowledge of the natures of all earthly creatures in the Garden of Eden', writes Bono, 'access to the pristine Adamic language promised to unlock the secrets of the very Book of Nature for its sixteenth-century readers'. 118 The concept of the pristine knowledge was particularly attractive, and in this respect such Dutch scholars as Stevin, Lansbergen, Willebrord Snellius and Otto Heurnius were no exception.119

While the status of the Bible was still beyond all question, the verdict on the classical authors varied by discipline and from person to person. The conceptual framework, however, in which the sciences were taught in the late sixteenth and early seventeenth century was Aristotelianism. This impressive system made it possible to understand the structure of the cosmos, the coherence of everything that had been created, and the place of humankind within this whole. Aristotelianism provided the wider perspective from which theology,

Western Science; Grant, Planets, Stars and Orbs.

 $^{^{116}}$ Walker, The Ancient Theology; Céard, 'De Babel à la Pentacôte'; Assmann, Moses the Egyptian.

Giard, 'Remapping Knowledge, Reshaping Institutions', 26.

Bono, Word of God, 14.

Stevin, De Wysentijt; Heurnius, Barbaricae philosophiae antiquitatum libri duo;
 Snellius, Descriptio cometae; Lansbergen, Progymnasmatum astronomiae restitutae liber I.
 See for example: Schmitt, Aristotle and the Renaissance; Lindberg, Beginnings of

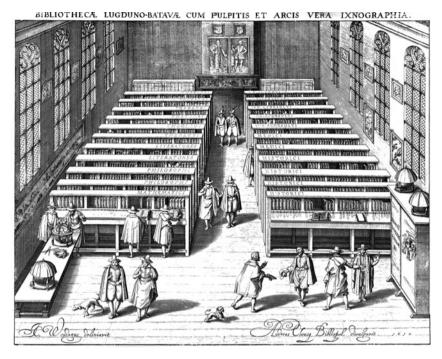


Fig. 8. The Leiden university library, as depicted by Jan Woudanus in 1610 (UBL).

medicine, physics and rhetoric could be taught. It formed the intellectual framework for the writings of Hippocrates, Galen and Ptolemy. In fact, it did not make much difference whether the professors taught the wisdom of the ancients on the basis of the scholastic manuals (an eight-page summary of Aristotle's physics) or with the extant texts of the ancients themselves. The academic inquirer into nature was first and foremost a philologist and exegete.

The foundation of Leiden University in 1575 marked the beginning of the institutionalisation of the practice of science in the Netherlands. In spite of the fact that other universities were to open elsewhere in the Dutch Republic later on, Leiden University was to remain the most important throughout the seventeenth century and to acquire a European reputation.¹²¹ Until around 1640 the subservient status of the natural sciences vis-à-vis theology within the university system was

¹²¹ See, for example: Lunsingh Scheurleer ed., *Leiden University*; Frijhoff, *La société néerlandaise et ses gradués*; Otterspeer, *Leidse universiteit* I; Grafton, *Athenea Batavae*.

hardly called into question. Although there was in theory a sharp distinction between theology and the disciplines dedicated to medicine and philosophy, the dividing line was not always clear in practice. This was partly for practical reasons—some professors held more than one chair at the same time—but the underlying reason was primarily the merging of Peripatetic philosophy with Christian doctrine.

The conviction that the Book of Nature should be read on the basis of the Bible was thus by no means an exclusively theological dogma. With the exception of the group of bright sparks (vernuftelingen) associated with Stevin, until 1640 we find few examples of scientists for whom the biblical framework was *not* the basis of their reflections on the physical world. The Holy Scripture, particularly the Pentateuch, provided the framework within which the antiquity of the earth, the position of the sun, the distribution of peoples, flora and fauna as well as numerous questions of detail were understood. A number of examples can illustrate this attitude. Petrus Plancius (1552–1622), an Amsterdam cartographer, navigation instructor, orthodox Calvinist and one of the most famous ministers of his day, ventilated all his scholarship to reconstruct the precise location of Paradise, the sojourns of the Israelites through the wilderness, and other problems of biblical geography. 122 The correspondence of the young philologist, cosmographer and fervent Counter-Remonstrant Johannes de Laet (1581–1649) shows that he and his mentor Scaliger were also concerned with the location of the Garden of Eden. 123 The herbal garden (cruythof) that the famous botanist and minister Hondius eulogised at length in his Moufe-schans was a recreation of this Paradise, where God

...once put everything in the field In the beginning, As he saw fit, To please mankind.¹²⁴

Referring to the Bible, Philips Lansbergen not only emphasised the religious dimension of astronomy, but also published a biblical chronology. In the spirit of the great Scaliger, he wrote a *Chronologiae sacrae* (1625) in which every event from the Creation, Flood, Babel and Moses' exodus from Egypt to the destruction of the Temple could

Plancius, Tabula geografica, in qua Paradisus...describuntur.

¹²³ Scaliger, Epistolae omnes, 735–736.

¹²⁴ Hondius, Dapes inemptae, of de Moufe-schans, 74.

be dated accurately. 125 Conceptions of the prisca scientia played an explicit role here, as they did for the Leiden professor of medicine, Otto Heurnius (1577-1652), who collected mummies, funerary statuettes, lentils and other 'rarities', intended to bring to life the history of Moses' people in Egypt, for the anatomical theatre. 126 Heurnius, who has gone down in history as one of the founders of clinical teaching, even wrote a book on the philosophy of the Egyptians, who were assumed to have initiated Moses in the mysteries of nature. The minister and professor Johannes de Mey (1617–1678) from Zeeland began to publish a series of extremely interesting works in 1651 in which all the natural phenomena mentioned in the Old Testament were investigated and explained.127

In its most radical form, this approach is known as Mosaic physics. 128 It was less of a clearly defined doctrine than a movement which is indicative of the spiritual orientation of many, chiefly Protestant scholars. A famous representative was the French theologian Lambertus Danaeus (1530-1595), who received an appointment in Leiden in 1581 to give more prestige to the feeble theological faculty. Danaeus, a follower of Calvin, was an extremely orthodox thinker. His activities in Leiden caused quite a stir, leading to his departure two years later. His influence in the Dutch Republic, however, extended much further than his short stay might suggest. Danaeus' aim was to subordinate church, society and science to the Word of God, as expounded in a manual with the revealing title Physica christiana (1576–1580). 129 In this work Danaeus explained that natural science existed solely for the glory of God, and must be based on a strictly literal reading of the Bible. He was firmly convinced that the Pentateuch provided all the necessary knowledge of the Creation. External sources of knowledge were to be avoided as much as possible. God's Word was the alpha and omega of all science, and if Aristotle appeared to be at odds with Moses, the Philosopher had to back down. 130

¹²⁵ Lansbergen, Chronologiae sacrae libri III. On biblical chronology see: Grafton, 'Joseph Scaliger and Historical Chronology'.

Jorink, 'Noah's Ark Restored (and Wrecked)'.
 See for example: De Mey, Commentaria physica; Idem, Sacra physiologia.

Harrison, The Bible, 138-147; Blair, 'Mosaic Physics'; Crowther, 'Sacred Philosophy, Secular Theology'.

¹²⁹ Danaeus, Physica Christiana; Idem, Physices Christianae.

¹³⁰ Fatio, Méthode et théologie; Idem, Nihil pulchrius ordine.

This uncompromising line was developed further by the influential orthodox calvinist Gisbertus Voetius. 131 He had studied theology in Leiden during the Bestandstwisten, the religious disputes that brought the Republic on the brink of civil war. Afterwards he worked as a minister, and was appointed professor of theology in Utrecht in 1634. He was above all the spokesman of the Dutch Puritan movement known as the Further Reformation (Nadere Reformatie), which strove for an internalisation of religious experience and the subordination of church and society to divine law. 132 This applied to science too, and it is no coincidence that Voetius often fell back on Danaeus. 133 Voetius ardently expressed his views on the relation between the Bible and the Book of Nature. The importance of the latter was beyond all doubt, but primacy still lay with the Holy Scripture. When the Illustrious School was opened in 1634 in Utrecht, the freshly appointed professor delivered a speech on the need to link science with religion, Oratio de pietate cum scientia conjungenda. After a summary of the wonders of nature, based on the *Psalms* of David, Voetius stopped in his tracks for a moment:

For if I were to open the school and the Book of Nature, to turn every page of this book and to pay closer heed to the voices of the creatures, our oration would certainly find a beginning more easily than an end.¹³⁴

This did not stop him from going into the subject at great length. The orthodox point of view on the relation between the Bible and the Book of Nature was repeated in this oration and in the attack on the supporters of natural theology that Voetius launched at the same time: the Book of Nature should *only* be studied on the basis of the Word of God.¹³⁵ When the Illustrious School became a university in 1636 and Voetius was appointed rector, he delivered another inaugural speech. This time his credo was far more emphatic. Without beating about the bush he claimed that all necessary knowledge was enshrined in the Holy Scripture: 'So that we may rightly call the Scripture the Book

¹³¹ Duker, Voetius; Van Ruler, Crisis of Causality; Goudriaan, Reformed Orthodoxy and Philosophy.

¹³² Brienen e.a., De Nadere Reformatie; Brienen ed., Theologische aspecten; Israel, Dutch Republic, 474–478, 690–700; Frijhoff, Fulfilling God's Mission, passim.

¹³³ Van Ruler, Crisis of Causality, 17; 43-44.

¹³⁴ Voetius, Oratio, G2/v.

¹³⁵ Voetius, *Thersites*, 273.



Fig. 9. The minister and geographer Petrus Plancius is chiefly remembered for organizing courses in navigation for seamen. He also speculated on the location of Paradise (UBA).

of all sciences, the Sea of all wisdom, the Academy of Academies'. The same was true of the disciplines of medicine and philosophy that were handmaids to theology. Philosophy, according to Voetius, was purely 'an instrument to understand the Holy Scripture and Theology better'. Referring to Danaeus' *Physica christiana*, Voetius stated that natural science was based on and was at the service of a strictly literal interpretation of the Bible. It would be difficult to overestimate the importance of this principle.

Since the Holy Scripture comprised all knowledge, it was the source of all authority and was self-explanatory. 'Scripture was the source of its own authority', McGahagan writes, 'in the same sense that light was both the principle of visibility and of the act by which we see illuminated objects. The analogy indicates that Voet found Scriptural interpretation as completely unproblematic as the act of seeing'. 138 For Voetius, understanding the Scripture was entirely unproblematic. Although he was a defender of scholastic Aristotelianism, he considered that external aids should be avoided as much as possible when it came to biblical exegesis. He was not entirely wrong in fearing that if rationalist insights were to be applied, for example, the authority of the Bible would be undermined. It was absolutely not his intention to practise natural philosophy, but to explain the Word of God to his audience and readers, to defend it, and to purify it of incorrect interpretations. The Book of Books only admits of a single exegesis. It may not be interpreted allegorically or typologically, nor does it accommodate itself to common language usage: it says what it says. In the eyes of Voetius and those who shared similar views, the Bible was not descriptive but normative. Reformed theologians did not say 'in ancient Israel the church was in principle independent of the king', but 'this passage shows that the Dordrecht Synod is the correct one'. 139 Holy Scripture was seen as a treasure-house of truths, not as a continuous story of God's acts in history.140

Setting out from the premise of the completely transparent, timeless and universal character of the Bible, Voetius considerably accentuated the Reformed understanding of the Book. The orthodox but in fact

¹³⁶ Voetius, Sermoen, 16.

¹³⁷ Ibid., 27.

¹³⁸ McGahagan, Cartesianism, 64.

¹³⁹ Van Rooden, Theology, Biblical Scholarship and Rabbinical Studies, 133.

¹⁴⁰ Graafland, 'Schriftleer en Schriftverstaan', 35–36.

fairly flexible idea that the Book of Nature should be read through biblical spectacles was now strictly defined: the Book of Nature was the Creation as described in the literally understood textus receptus of the Bible. The room for interpretation was reduced to an absolute minimum: liber naturae and Sacra Scriptura were congruent. This view of the liber naturae was not only the logical consequence of Voetius' biblicism, but it also had the major advantage of detonating the inherent dangers of philosophy and natural theology. It is certainly no coincidence that one of Voetius' more extended reflections on the Book of Nature was aimed against the Remonstrants. In connection with the well-known Psalm 19:1 ('The heavens declare the glory of God'), Voetius remarked that here David guides us 'from the Book of Nature and the works of God to knowledge of our Creator, and in this way calls us to piety'. 141 When Voetius talks about nature, this logically refers neither to the world around him nor to contemporary philosophical insights, but always to the text of the Bible. In discussing the Creation, each time he provides a wealth of biblical references, some of them accompanied by references to the church fathers, Aristotle and a dozen scholastic philosophers. During the catechism, for example, Voetius asked: 'Does this providence concern all things?' The answer consisted of a flood of biblical citations. 'Does God also govern the rats, mice, flies, ants, snakes, toads? Does he also govern the grasshoppers?'. Yes, of course: for the evidence, see Exodus 10:4; Leviticus 11:29; 1 Samuel 6:4; Psalm 105:34; Ecclesiastes 10:1; Isaiah 7:18 and 66:17; Joel 2:25; Amos 7:1; and many more. 142 During his academic activities too, Voetius vigorously defended the authority of the Bible in all matters of natural philosophy. For instance, if the Bible stated 'Who laid the foundations of the earth, that it should not be removed for ever' (*Psalm* 104:5), this meant that the doctrine supported by the Copernicans was erroneous, or-even worse-denied the authority of the Bible. The Creation could not be anything but a book that could be understood with the help of the letter of the Holy Scripture.

In the course of Voetius' long life, his exegetical methods came under increasing fire from different quarters. All the same, Christian physics remained a force to be reckoned with throughout the seventeenth century. Voetius trained innumerable students who, upon completing

¹⁴¹ Voetius, Thersites, 273.

¹⁴² Voetius, Vraegen over den Catechismus, 86.

their studies, were to occupy the pulpits and chairs in different parts of the country and were fully prepared to stand up for the teachings of their mentor.¹⁴³ There was thus a broad basis of support for a Biblebased 'physics' down to late in the eighteenth century.

Still, not all scholars placed such an exclusive emphasis on the letter of the Scripture. Without disrespect for the authority of the Bible, medical and philosophical faculties in the Netherlands focused on the exegesis of other ancient texts, either on the basis of scholastic manuals or directly. This too is an important factor in the discussion of the interpretation of the Book of Nature. 'Ad fontes', the humanists whispered in their studies. In 1582, for instance, students in Leiden requested to be taught in the original Greek texts of Aristotle.¹⁴⁴ The rector, the great humanist Justus Lipsius, made the same recommendation, and it was carried out. In the medical faculty the professors read Hippocrates, Galen and Dioscorides, while in the faculty of *artes* their fare was Aristotle, Ptolemy, Seneca and Euclid. They also sometimes subjected the biblical texts that had come down to them to rigorous philological analysis. 145 While the theologians studied the textus receptus of the Holy Scripture, which from the point of view of dogma was regarded as unproblematic, their colleagues in the lower faculty were primarily interested in the philological aspects: enigmatic Hebrew words, analogous citations from ancient sources, variant readings, and so on. That historical and critical approach certainly contained a religious dimension: the closer to the original source, the closer to the Creator. This pious endeavour was sometimes to lead to surprising results.

An important work in this connection was published in 1641 under the intriguing title *De theologia gentili sive physiologia christiana; sive de Origine ac Progressu Idololatriae* (The religion of the heathen and the Christian doctrine of nature; on the origin and progress of idolatry and in addition the wonders of nature, by which man is led to God). The author was Gerardus Johannes Vossius (1577–1649), who had been a student in Leiden, was professor of rhetoric there from

 $^{^{143}}$ See for example the disputations of Voetius' students in: Voetius, *Selectarum disputationum theologicarum*; and the work of his son, Paulus Voet, *Theologia naturalis Reformata*.

Molhuysen, Bronnen I, 103*-104*.

¹⁴⁵ Molhuysen, Bronnen I, 126; 157*–158*; 192*; 384*; 400*; Waszink, 'Classical philology'; De Jonge, Bestudering van het Nieuwe Testament; Van Rooden, Theology, Biblical Scholarship and Rabbinical Studies, 132–157.

1622 to 1632, and held the chair in history at the Amsterdam Athenaeum Illustre from 1632. He was a productive author, whose speculations included that of the language that Adam had spoken. 146 One of Vossius' best-known works has been called 'the last of the Renaissance monsters', a qualification that is also applicable to the humanist himself. 147 De theologia gentili was widely regarded at the time as Vossius' most important work, and was the result of researches that had begun in 1620.148 The purpose of the weighty tome was to lead humankind to God by means of the wonders of nature. To that end Vossius provided an exhaustive survey of the way in which the most diverse natural phenomena were regarded in Christian and non-Christian history, and derived them from a single source: the Bible. The pagan cultic forms, which had been so amply described in antiquity, were in fact the consequence of a regrettable demise of the knowledge that was enshrined in the Old Testament. The heathen were guilty of only one thing, Vossius patiently explained: they thought that God was identical with nature. But God was not identical with nature, nor was he a part of it: the Lord was 'Naturae Auctor'. 149 Vossius went on to describe the different opinions about the sun, comets, rainbows, stones, plants, animals, monsters and numerous other phenomena, and tried to demonstrate that over the centuries they had served as sources of religion for both the heathen and the Christians. The histories of the Chaldeans, Babylonians, Persians, Greeks, Romans, Germans, and even the inhabitants of the New World, according to Vossius, were essentially slightly distorted and corrupt versions of the Pentateuch. Thus the Germanic Wodan, the Egyptian Thoth and the Dutch God all referred to the same supreme deity. 150 Similarly, the testimonies of Adam lived on in the legends of Saturn and a Germanic deity called Mannus.

By deriving all ideas and practices from their basically monotheistic, Christian essence, Vossius believed that the Christians would be confirmed in their faith, while at the same time an effective weapon was forged against ancient and contemporary superstition. The result of his efforts was a massive but also ambivalent book. Like Voetius, the

¹⁴⁶ Rademaker, Vossius; Klijnsmit, 'Vossius on Hebrew'.

¹⁴⁷ Sellin, 'Last of the Renaissance Monsters'.

¹⁴⁸ Wickenden, Vossius and the Humanist Concept of History, 27, 30.

¹⁴⁹ Vossius, De theologia gentili et physiologia Christiana (Amsterdam 1641; I consulted the edition of 1700), 'Praefatio'.

¹⁵⁰ Vossius, De theologia gentili, 102.

irenical Vossius, who was viewed with suspicion in Counter-Remonstrant circles, defended a literal reading of the Bible. At the same time, however, he attached great importance to other sources, ranging from major classical authors to the *Itinerario* (1594) of Jan Huygen van Linschoten. Libertas philosophandi was a priority for Vossius. Already in 1631 he wrote: 'As a young man I swore by the words of Aristotle, but now that I am older I am becoming an eclectic'. Ten years later he wrote: 'I like the words Pliny wrote to Caenius: I belong to those who admire the ancients but I do not despise the thinkers of our own time as some do'.151 De theologia gentili is above all a solid compendium of practically everything that had been written on natural phenomena down to 1641. It was a veritable mine of references that readers could use to support the most divergent arguments. The work could be used to show the greatness of the God of the Old Testament, but it could be—and was—equally well interpreted in the opposite way as a plea for natural theology or even deism. 152

CHAPTER TWO

The humanist cult of sources sometimes led to paradoxical results in the medical faculties too. A good example is provided by Leiden, where it was decided in the 1580s, following the examples of Padua and Pisa, to back up teaching with an anatomical theatre and a botanical garden. 153 Both institutions were operational by about 1594, and swelled with ever expanding collections of naturalia and curiosities. The collections, which soon made a name for themselves all over Europe, were originally intended to illustrate Galen, Hippocrates, Dioscorides, Theophrastus and Pliny. Eventually they were—unintentionally—to call the classical tradition into question.

Anatomy, botany and the collection of naturalia can all be considered a part of natural history. This differed from natural philosophy by virtue of its less speculative, much more descriptive approach. Until late in the seventeenth century it was a humanist activity par excellence. 154 As the term natural history already indicates, the essence of the res naturae lay in their historia. Besides describing the external physical characteristics of a thing, to know its nature meant above

¹⁵¹ Quoted in: Rademaker, Vossius, 30.

See: Bedford, Herbert of Cherbury, 178–180; Popkin, 'The Deist Challenge'.
 De Jong, Nature and Art, 129–142; Otterspeer, Leidse universiteit I, 189–198; Cook, Matters of Exchange, 110-132; Huisman, Finger of God, 17-42.

Dannenfeldt, 'University of Wittenberg'; Reeds, *Botany in Medieval and Renaissance Universities*; Findlen, *Possessing Nature*; Cook, 'Natural History'; Siraisi, 'Anatomizing the Past'; Ogilvie, Science of Describing; Findlen, 'Natural History'.

all providing summaries of its names, etymologies, biblical and classical references, occult properties and symbolism. The most influential works of natural history of the sixteenth century were the Historia animalium (1543-1545) by Conrad Gessner and the Opera of Ulysse Aldrovandi, most of which were published posthumously between 1602 and 1648. These works are characterised by the philologically precise concordances of everything that had ever been written on the res naturae, often beginning with the extant Hebrew and Greek texts of the Bible. 155 In spite of the sometimes surprisingly realistic illustrations and contemporary observations, the fauna and flora were embedded in a pedantic network of references. Various scholars have recently stressed the fluidity of the border between natural history, philology and emblematics at this time. 156 Nature was regarded fairly literally as a book full of divine meanings. Animals, plants, shells and stones were not just considered in terms of their economic or medical value, but above all as a starting point for Christian reflections. For example, Ex minimis patet ipse Deus (God is visible in the miniature) was the motto of an emblem of Adriaan van der Venne (1589-1662) showing three men examining different plants.¹⁵⁷ Petrus Hondius called his garden and collection of naturalia 'a book made by God himself'. 158

This is the perspective from which to consider the *hortus botanicus* in Leiden, which opened in 1594. It was implemented under the supervision of the famous botanist Charles de l'Écluse (Carolus Clusius, 1526–1609) and *de facto* laid out by his assistant Dirck Outgaersz Cluyt (1546–1598).¹⁵⁹ The original purpose of the collection of plants was to instruct students as to what they were called 'by ancient writers'.¹⁶⁰ The collection soon expanded to include maps, books and all kinds of *naturalia*. The result was a living herbal, a three-dimensional teaching aid.¹⁶¹ On the guided tours of the garden given by Clusius' successor Petrus Pauw (1564–1614), he not only explained the properties

¹⁵⁵ Gmelich-Nijboer, *Conrad Gessner's 'Historia Animalium'*; Ashworth, 'Natural History'.

 $^{^{156}\,}$ Reeds, 'Renaissance Humanism and Botany'; Harms, 'Natural history and Emblematics'; Hoeniger, 'How Plants and Animals were Studied'.

¹⁵⁷ Zeeusche Nachtegael, 21.

¹⁵⁸ Hondius, Moufe-schans, 533.

¹⁵⁹ Hunger, *Charles de l'Ecluse*; Fat and De Jong eds, *Authentic Garden*; Egmond, Hoftijzer and Visser eds, *Carolus Clusius*.

¹⁶⁰ Molhuysen, Bronnen I, 180*

¹⁶¹ De Jong, Nature and Art, 129-142.

Ex minimis patet ipse Deus.





Iet isser oyt van God soo cleyn en slecht geschapen,
Of 'twijst sijn Schepper aan;
Men kan uyt alle dingh ghelijck met handen rapen,
Dat God dat heeft ghedaan: (den
Siet maar een plantjen aan, een struyckjen kleyn van waarHet toont dat God daar is,
Want 'tWesen dat het heeft, koomt niet eerst uyt der aarden,
Maar van Gods macht ghewis;
Het Leven dat het heeft, kan niemand haar oock geven

Leven dat het heeft, kan niemand haar oock geven Dan God die boven leeft:

C 3 Wan-

Fig. 10. The motto 'Ex minimis patet ipse Deus' was rather popular in Dutch emblem books. This emblem by Adriaan van der Venne is taken from the Zeeuwsche Nagtegael (1623) (KB).

of the plants but also commented on their names and etymologies in different languages. 162 Verbum thus coincided with res, although the emphasis increasingly came to lie on the latter. All investigations and religious reflections were based on the classical and Christian heritage, but physicians and botanists did not confine themselves to an uncritical copying of the Greeks and Romans. The same critical scrutiny to which ancient writings were exposed was applied to the world of living nature and related to what was already known. A gradual calling into question of the textual tradition was the unintentional but inevitable result. The enormous quantities of naturalia that arrived from the East and West Indies, Africa and the polar region were sometimes difficult to match in the classical sources. For instance, 600 plants were known from antiquity, while the hortus botanicus in Leiden already had 1,060 in the year of its opening, and that was before the large flows of naturalia got under way which the voyagers to the East Indies collected for the university. 163 The famous Exoticorum libri decem (1605) by Clusius already displays a certain scepticism with regard to the omniscience of the classics. Had they known the bird of paradise? No, was Clusius' verdict. The same was true of the armadillo, the potato, the dodo, the penguin, and many other exotica. 164

This outline shows that two closely related developments were taking place within the walls of the Dutch universities. On the one hand, nature was studied as a text and expounded on the basis of the Bible and the classics (in their original or scholastic guise). Voetius' Mosaic physics is a radical and influential example of this tendency. On the other hand, the classical tradition gradually came under pressure. The digging up and analysis of the enormous corpus of ancient treatises sometimes led to inconsistencies and contradictions. The Dutch case presents us at a micro-level with a phenomenon that was taking place on a larger scale all over Europe: information overload and the calling into question of the classical heritage. The printed book, humanism, voyages of discovery, astronomical observations, developments in natural philosophy, the mania for collecting *naturalia* and many other factors contributed to call the *sapientia veterum* into question. The familiar system of texts, commentaries and references led not to

Pauw, Hortus publicus Academiae Lugduno-Batavae, *4/r.

Reeds, 'Renaissance Botany', 40. See also: Ogilvie, 'The Many Books of Nature'.

¹⁶⁴ Clusius, Exoticorum libri decem, 358–363 and passim. See also: Mason, Before Disenchantment, 124–148.

certainty but to major problems of interpretation. Was the pagan worship of nature a form of natural theology? Had the *antiqui* already known and described everything? How could contemporary observations and insights be incorporated in the Christian and Aristotelian tradition? A hermeneutic crisis was at hand.

2. Two books up for discussion

The decomposition of the classical corpus

This brings us to the heart of the matter. Reformed orthodoxy had it that the Book of Nature had to be understood on the basis of the Holy Scripture. This apparently clear principle was not unproblematic in practice. According to the Belgian Confession, the Bible consisted of the canonical books. 165 The Book of Nature was not clearly defined anywhere, but seemed to be synonymous with God's Creation as understood on the basis of the Holy Scripture and, in second instance, scholastic Aristotelianism. Voetius fixed the relation between the two books of God by only accepting a literal reading of the Bible as the key to the Book of Nature, which made the liber naturae and Sacra Scriptura seem like two constant magnitudes. That, however, is by no means what they were. The traditional relation between the two books of God was to come under pressure in the course of the seventeenth century, not only as a result of the revolutionary developments in the field of the natural sciences, but above all because of the developments within philology and exegesis. Both the Book of Nature and the Bible were subjected to a new reading by a growing group of scholars. The seemingly stable relation between the two books gradually turned into a comparison between two variables.

Let us leave the question of the status of the Bible for a moment. Aristotelianism, which formed part of the foundation on which reflections on the Book of Nature were based, was an astonishingly flexible system. However, it had already increasingly come under fire all over Europe in the sixteenth century, though without being the worn-out system that it was long taken to be. The Netherlands circa 1600 was no exception in this respect. The criticisms were often directed at questions of detail. For instance, the new star that appeared in the sky in

¹⁶⁵ Bakhuizen van den Brink, Belijdenisgeschriften, 75.

1604 and the clearly superlunary position of the comet of 1618 both raised problems since they were at variance with the Aristotelian position that the firmament was unchanging. The same applied to Stevin's experiments with falling bodies, whose results were diametrically opposed to Aristotelian physics. All the same, generally speaking it was still the case that Aristotelianism as a broader framework held its own for a remarkably long time in the Dutch Republic too. It is important that the criticism of the Greek philosopher was part of a larger process, in which, partly as a result of practical experiences and discoveries, all of the extant—and sometimes plainly contradictory—texts from antiquity were subjected to scrutiny.

Autopsies were already being carried out on human and animal corpses in the Leiden anatomical theatre from 1594 on. 168 It gradually transpired that Galen was wrong on several counts. 169 Another example is the telescope. Jacob Metius (c.1580–1628), one of the Dutchmen who claimed to have invented the instrument in October 1608, asked himself whether it had been known to antiquity.¹⁷⁰ 'Let everyone praise antiquity as much as he likes', Constantijn Huygens soberly remarked, 'this is one of the things that have never existed before'. ¹⁷¹ In 1614 the poet Roemer Visscher commented on the monsters described by the writers of antiquity: 'our new shipmasters and steersmen, who have sailed everywhere by now, find hide nor hair of them'. 172 Questions were also raised by the flood of information that came in from the East and the West, as we saw in the case of Clusius. His pupil Johannes de Laet, the exceptionally well informed historian of the Dutch West Indian Company (WIC), wrote in his Nieuvve Wereldt, ofte beschrijvinghe van VVest-Indien (New World or description of the West Indies, 1625) that this continent 'was unknown to the ancients in so far as can be ascertained from their writings'. 173 De Laet left open the question of whether Moses should be considered as one of the ancients too.

¹⁶⁶ Jorink, 'Nicolaus Mulerius'; Van Nouhuys, Age of Two-faced Janus, 321–375.

¹⁶⁷ Stevin, De weeghdaet, 66; Dijksterhuis, Mechanisering, 363–364.

Lindeboom, 'Dog and Frog'; Huisman, Finger of God, 14-42.

¹⁶⁹ Cf. Conrad ed., Western Medical Tradition; French, Dissection and Vivisection; French and Wear eds, Medical Revolution of the Seventeenth Century; Park, Secrets of Women.

¹⁷⁰ De Waard, *Uitvinding der verrekijkers*; Van Helden, *Invention of the Telescope*; Van Helden, Dupré, Van Gent and Zuidervaart eds, *Origins of the Telescope*.

¹⁷¹ Huygens, Mijn jeugd, 110.

¹⁷² Visscher, Sinnepoppen, 156.

¹⁷³ De Laet, Nievve Wereldt, ofte beschrijvinghe van VVest-Indien, **/r.

The preacher, linguist and natural historian Abraham van der Mijle (1563–1637) went a step further: around 1630 he asked whether the peoples, animals and plants overseas had been known to the author of the Pentateuch, and if not, how they had ended up in America.¹⁷⁴ These were important questions, whose long-term influence should not be underestimated.

There was sometimes uncertainty about the dominant philosophical framework at a more abstract level too. It is known that Stevin advocated a practical approach to natural inquiry, in which the gulf between the idle speculations of philosophers and the everyday experiences of working people would be bridged. This was more or less the same as the position advocated by Petrus Ramus (1515–1572) and Francis Bacon (1561-1621), theoreticians who were also read in the Netherlands. 175 As an extension of this, new physical theories were formulated or new life was breathed into old, alternative ones. The mechanistic natural philosophy of Isaac Beeckman was important. The explanatory principle consisted not in Aristotelian teleology and the doctrine of the elements, but in the push and pull of tiny particles of matter. Beeckman's corpuscular theory (which was not published), and the principle of inertia that he formulated marked a radical break with Aristotelian physics, and were to have a profound influence on Descartes.¹⁷⁶ Other scholars who wrestled with the Aristotelian legacy sought enlightenment in the library from such ancient philosophers as Seneca, Plato, Democritus, Epicurus and Anaxagoras.

The consequence of this tendency was that a plurality of opinions were proclaimed, usually within the very ample margins of Aristote-lianism. The authority of the classics, however, was no longer taken for granted by everybody. The corpus of extant writings, which the philologists had uncovered from a layer of dust and were now often available in print, proved on many occasions to be simply contradictory. Partly as a result of this, the conviction that the ancients taught timeless truths was called into question in certain circles. The always receptive Constantijn Huygens put it like this in a poem in 1647:

...The bookworms are blind, And see only by the book: they stumble like children,

¹⁷⁴ Hooykaas, 'Abraham van der Mijle'.

¹⁷⁵ Van Berkel, *Beeckman*, 257–290 and *passim*; Dibon, 'Bacon en Hollande'.

¹⁷⁶ Van Berkel, Beeckman, 292-302.

And hold firm course in all they do and say: Five call, that's the road, ten can refute it, And truth is but one. 177

Awareness grew that the ancients had not known everything, but that their writings were the reflection of insights tied to a particular time and place. The process might be called the deconstruction of the canon. Each work had to be evaluated separately. Euclidean geometry, for example, stood its ground, but did everything that Pliny had written still hold?¹⁷⁸ Had Galen missed some essential facts? How could the recent astronomical observations be fitted into the Aristotelian or Ptolemaic systems? Was the Corpus Hermeticum a collection of cosmological texts from the Egypt of Moses, or a forgery from the first century AD?¹⁷⁹ Could the divinatory practices described by Livy and Tacitus serve as an example?¹⁸⁰ Were the many gods of ancient literature suitable themes for contemporary Christian lyric poetry?¹⁸¹ In the second quarter of the seventeenth century, some scholars gradually came to realise that the world of the ancients was essentially different from that of the Reformed Dutch. 182 The feeling that antiquity was immediately close was replaced by the awareness of a certain historical distance. Some philosophers, philologists and theologians attempted to grasp the historical context of the ancient writings. This process affected many fields, including university education. Many of the Dutch professors who taught in the faculties of medicine and artes in the middle of the seventeenth century were eclectics who freely drew on both classical and contemporary sources.

Amid this pluralism, European philosophers sought a single new and unshakeable premise on which all knowledge could be based. The first to formulate a successful comprehensive alternative to Aristotelianism was Descartes. Inspired by Beeckman and encouraged by Constantijn Huygens, he set himself the task of describing a new philosophy. Alarmed by the condemnation of Galileo in 1633, Descartes decided to keep the ambitious work *Le monde* in manuscript form for

¹⁷⁷ GCH IV, 115.

¹⁷⁸ Van Maanen, Facets of Seventeenth-Century Mathematics, 1–18.

¹⁷⁹ Grafton, Defenders of the Text, 145-161.

¹⁸⁰ Peeters, 'P.C. Hooft en P.C. Tacitus'.

¹⁸¹ Spies, 'Helicon and Hills of Sand'.

¹⁸² Ĉf. Van de Waal, Drie eeuwen vaderlandsche geschied-uitbeelding; Blaas, Anachronisme en historisch besef; Langereis, Geschiedenis als ambacht.

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Fig. 11. Engraving, taken from Jan Luyken's *Schriftuurlyke geschiedenissen* (1712) and illustrating *Genesis* 9:13, 'I do set my bow in the cloud, and it shall be for a token of a covenant between me and the earth' (KB).

the time being, and even considered never publishing again. In 1635 Huygens begged the philosopher to publish: 'hasten to the miracle of making the blind see'.¹⁸³ *Discours de la méthode* and the three *Essays* on optics, meteorology and geometry were published in 1637, later followed by such works as the *Meditationes* on metaphysics in 1641 and the *Principia* on physics three years later.

Right from the start Descartes removed any doubt about his epistemological premise: it lay not in classical or contemporary literature, but in pure reason. Descartes rejected the idea that anything could be learnt from all those texts and commentaries. In the Discours he described how, after having been brought up on truths and above all untruths from old books, he decided not to strive for a science any longer that he could not find either in himself or in 'the big book of the world'.184 The use of this metaphor is striking. The Cartesian Book of the World seems to be entirely independent of the Augustinian tradition. It has nothing to do with universal knowledge of God or the Bible. In the context of the Discours, the book was no more than a metaphor for Descartes' nine years of roaming through the world. The metaphor is used here in opposition to the literary tradition: it refers to Descartes' brief personal experiences among foreign people, habits and customs. His study of the Book of the World taught him only two things: that turning his back on sham scholarship was the right decision, and that in the future he would only be able to trust his own reason. This was in complete opposition to the use of the metaphor of the Book of the World as Dutch Reformed circles applied it.

Descartes claimed to be able to offer an alternative to scholastic Aristotelianism. He based all science on pure reason, 'clear and sharply distinguished ideas'.¹⁸⁵ This foundation was only achieved after a process that has come to be known as Cartesian doubt: the questioning of received knowledge and ideas. As Voetius and his followers immediately realised, this also implied calling into question the existence of God and his revelation in the Holy Scripture. The door to scepticism and even atheism would be set wide open. This alleged attack on the authority of the Bible helps to explain the bitterness of

 $^{^{183}}$ AT I, 325; BCH II, 118–119; AT I, 333; BCH II, 141–142. See: Jorink, 'Geef zicht aan de blinden'.

¹⁸⁴ AT VI, 9.

¹⁸⁵ See for example: AT VI, 18.

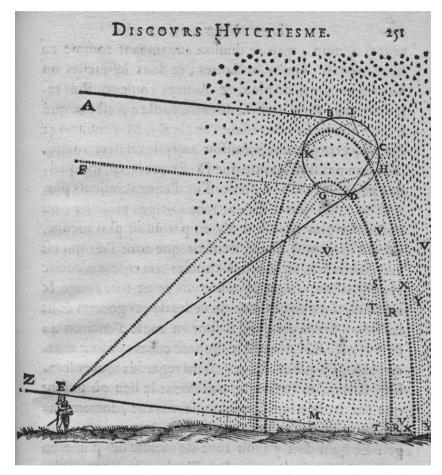


Fig. 12. Rainbow, as depicted in René Descartes' *Dioptrique* (1637). The appearance is stripped of its biblical connotations, and reduced to a purely physical phenomenon (KB).

the reactions that the new philosophy provoked.¹⁸⁶ In the *Discours*, in his later works, and in his notorious polemic with Voetius, Descartes deliberately set the playing with biblical texts, commentaries and references to one side. According to Descartes Voetius' method consisted of plundering the commonplaces and indices of books in order to come up with a new collage.¹⁸⁷ Philosophy was not based on exegesis, nor was its purpose the interpretation of texts.

This brings us to the second point. Descartes saw the proof of the existence of God in the fact 'that I exist, and that there is a certain idea in me of the most perfect being, in other words, God'. 188 The philosopher considered that the idea of God, like his own thinking, could only be given by God himself. When God created humankind, he gave them an idea of God 'as an artist signs his work'. Since this notion of God could only be given by him, this was proof of his existence. The proof of divine existence had thereby become a matter completely internal to reason. 189 This idea appeared in a certain sense to be compatible with tendencies within natural theology, in which notions of an innate idea of God played a role. 190 Still, the Cartesian proof of the existence of God was difficult to reconcile with the doctrine of the two books of God, as taught by the orthodox Reformed church in his adoptive homeland, as it was entirely independent of God's revelation in Holy Scripture and the external confirmation that people could find in the Book of Nature.

The third point follows from the first two. In the field of both epistemology and metaphysics, Descartes was at odds with the traditional doctrine of the *liber naturae*. The same was true of his physics, that part of his philosophy that was to have the most influence in the Dutch Republic. Following Beeckman, Descartes claimed that there was a sole basic principle. The world consists of nothing but matter in motion. Everything is explicable in terms of the push and pull of minute, extremely hard particles of matter, which obey three natural laws.¹⁹¹ The whole of nature (whether the course of the planets, the beating of the heart or the flight of birds) is governed by the motion of particles

¹⁸⁶ Verbeek, 'From "Learned Ignorance" to Scepticism'.

¹⁸⁷ AT VIII-II, 52.

¹⁸⁸ AT VII, 51.

¹⁸⁹ Beyssade, 'The Idea of God'; Hatfield, 'Metaphysics and the New Science'; Goudriaan, *Philosophische Gotteserkenntnis*.

¹⁹⁰ Van Sluis, Herman Alexander Röell, 48-77.

¹⁹¹ AT VI, 42-43; Ibid., VIII-I, 62-65.

of matter that obey the God-given laws. Descartes denied the innate nature of every separate creature or phenomenon, rejected secondary causes and substantial forms, and reduced all natural processes to a few universally valid regularities without supernatural meanings. For instance, he provided a purely physical explanation of the rainbow, without the conventional reference to *Genesis* 9:13: 'I do set my bow in the cloud, and it shall be for a token of a covenant between me and the earth'.¹⁹²

Descartes described nature as a 'highly perfect machine'. 193 This term plays a crucial role in Cartesian natural philosophy and has a great explanatory value. It is probably not a metaphor for Descartes. As Van Ruler has written:

Nature is *quite literally* a giant item of clockwork. Physical phenomena are only then fully explained when they are explained by the reciprocal influence of bodies upon each other which ultimately derives from God's causing motion in the mechanical machine.¹⁹⁴

The concepts of 'the world is a machine' and 'the laws of nature' which were so appealing to the imagination created a framework in which natural philosophers could now dedicate themselves to independent inquiry free from the patronising of the theologians. The Cartesian notions function as a programmatic premise for the new physics, as a means by which a new idea about nature could be formulated. In this connection we are of course interested in the relation between these conceptions and the traditional idea of the Book of Nature.

At first sight there is an unbridgeable gap between the conception of nature as a machine and nature as a book. The Book of Nature was represented in the Dutch Republic as the combination of all creatures 'great and small, which are like letters', and which required exegetical instruments for their comprehension. In Descartes' natural philosophy, nature was regarded as an essentially meaningless mechanism. God had imposed 'his regular concourse' on the original chaos 'and let it operate in obedience to the laws that he established', Descartes wrote in the *Discours*. ¹⁹⁶ After God had created the world and set it in

¹⁹² AT VI, 325–344.

¹⁹³ AT VIII, 14.

¹⁹⁴ Van Ruler, Crisis of Causality, 234, italics are mine.

¹⁹⁵ Vermij, 'Wetten der natuur'.

¹⁹⁶ AT VÍ, 42.

motion, the world followed its own dynamism. This axiom had farreaching implications: there no longer seemed to be room for the story of the Creation. The biblical narrative of the six days of Creation was set aside as material for theologians, not philosophers. In his well-known debate with Frans Burman (1628–1679), Descartes even commented in plain terms on the first chapter of the book of *Genesis*: 'this narrative of the Creation is metaphorical'.¹⁹⁷ It is easy to imagine that the orthodox camp reacted furiously to such proposals. A follower of Voetius, Petrus van Mastricht (1630–1706), explicitly stated that Descartes' attempt to replace the *liber naturae* by the figments of his own imagination concealed a well-considered attack on the authority of the Holy Scripture.¹⁹⁸

The conflict between Descartes and Voetius was based on different views regarding not only the status of the Holy Scripture, but also the Creator. Within the Cartesian system, God seemed to have been reduced to the great Architect or Engineer who, once he had set the cosmic machine in motion, became redundant. This was diametrically opposed to the ideas entertained by the Dutch Reformed church, which made a sharp distinction between the six days of the Creation, when God created everything 'after his nature', and God's continuous 'government and preservation' of the world. The Belgian Confession explicitly stated:

After he had created all things, he did not abandon them or leave them to their fate or fortune, but directs and governs in accordance with his holy will.¹⁹⁹

In short, seen from this perspective, Descartes was denying the providence of God; he was one of the thinkers whom Calvin described as dreaming of 'an idle and unemployed God'.²⁰⁰ Descartes' writings seemed to presuppose an autonomous nature that had been left to its fate by God. Orthodox theologians immediately reached for their pens to combat this heresy.²⁰¹

Descartes himself was ambiguous on the relation between the 'divine concourse' and divine providence. It is therefore understandable that

¹⁹⁷ AT V, 169.

¹⁹⁸ Van Mastricht, Vindiciae veritatis et authoritatis Sacrae Scripturae, 'Dedicatio'.

¹⁹⁹ Bakhuizen van den Brink, Belijdenisgeschriften, 91-93.

²⁰⁰ Calvin, Institutes, I XVI, 1.

²⁰¹ Van Ruler, Crisis of Causality, 261-301.

his ideas were regarded by the Voetians as essentially materialistic and potentially atheistic. Cartesian conceptions were indeed the basis of Spinoza's heresies, according to which God was bound by his own unchanging laws. The strength of such conceptions as 'the world as a timepiece' or 'the laws of nature', however, resided precisely in a certain lack of precision. They could be taken to be incompatible with the Book of Nature as that was generally understood in the Dutch Republic, and that is probably what Descartes intended. However, all these ideas and concepts had more in common than may appear at first sight. The Stoic philosophers had already spoken of the *lex naturae*, and Cicero had put in the mouth of the Stoic Balbus the comparison of nature with a timepiece.²⁰² Of course, the Romans had something else in mind than Descartes, but it is questionable whether the Dutch followers of Descartes made the same distinction.

The idea that nature is a book assumes that it has an author; the timepiece presupposes a clockmaker; and the law of nature a legislator. Cartesian usage could lead to speculations about a divine engineer without a job. The notion of a relation between creator and nature and that of the world as a mechanism could of course easily be reconciled with one another. But Cartesian philosophy could also be interpreted in the opposite direction, namely, that that all of nature referred to a higher power.²⁰³ By reducing nature to its underlying, immutable laws, Creation was made dependent of the will of the divine legislator. Seen from this point of view, conceptions of the Book of Nature and the world as a machine were compatible, of not identical. Did they not both refer to a divine auctor intellectualis? Did they not both imply a thinking and creating power? It is precisely in this pluriform exegesis of the Cartesian writings that their importance lies. The emotions that Cartesianism provoked were enormous. When the Voetians cleared their throats and sharpened their quills, many other scholars were also obliged to clarify their standpoint. Some brushed the whole of Cartesian philosophy to one side. Others, such as Spinoza, went more profoundly into Descartes and based their own radical philosophy on his writings. Many Dutch natural philosophers ignored the offensive Cartesian metaphysics and as genuine eclectics selected only those ele-

²⁰² Cicero, De natura deorum II, xxxiv; see Ruby, 'The Origin of Scientific "Law".
²⁰³ Cf. Deason, 'Reformation Theology'; Westfall, 'The Rise of Science'; Garber, Descartes' Metaphysical Physics.

ments of his physics that enabled them to elaborate their own ideas. But there were also scholars—both philosophers and theologians—for whom the Cartesian doctrines on the underlying structure of the universe were a powerful impulse to view the Book of Nature with new eyes.

Rewriting the Book of Nature

Voyages of discovery, astronomical observations, philological developments and alternative classical and contemporary natural philosophies gradually undermined the certainty that nature was as Aristotle had written. For many scholars, the Book of Nature was no longer identical to the corpus of classical sources, editions, marginalia, commentaries and references, but bore a closer resemblance to an upturned letterbox. Everyone could draw on the letters scattered here and there to compose his own text with his own emphases. In Italy Galileo claimed that the Book of Nature was written in geometrical symbols and could only be understood by mathematicians. In the Dutch Republic Descartes resolutely pushed the metaphor of the book to one side and put his trust in reason and mathematical method. Dutch philosophers such as Johannes de Raey (1622-1707), a professor in Leiden and later in Amsterdam, followed the same course and separated theological doctrines from philosophical speculations and metaphysics from physics. 204 Voetius, on the other hand, spent his whole life emphasising that only the letter of the Bible was the key to the Book of Nature; the other hermeneutic principles were anathema. Between the radical Cartesians and the strict Voetians, however, was a large group of scholars philosophers, physicians, theologians and laymen—who followed an intermediate course and tried to understand and describe the Book of Nature in new terms. One of these was Constantijn Huygens. Where Huygens refers to 'God's two books' in his poem *Hofwyck*, he explicitly refers to the nature that can be perceived through the senses. Besides the text of the Bible, but relatively independent of it, that nature is a source of religious knowledge.²⁰⁵

New sounds could be heard in academic circles too. The Amsterdam professor of philosophy, Arnoldus Senguerdius (1610–1667)

 $^{^{204}}$ Schuurman, 'Ex naturae luminae et Aristotele'; Van Miert, Humanism in an Age of Science, 230–232.

Huygens, *Hofwyck*, 60.

announced in his 1648 oration that he did not want to blindly adhere to the letter of Aristotle. What the real philosopher requires is experience. Nature 'is a book that must be read by the philosopher', so that he sees, not through somebody else's eyes, but through his own.²⁰⁶ Similar views had also been aired by Senguerdius' Leiden colleague Adriaan Heereboord (1613–1661).²⁰⁷ During his oration on the occasion of occupying the chair of logic in 1641, he stated:

Let us wipe the dust from our eyes and not follow a single [authority], Aristotle; let us not only enter the school of Aristotle, but that of nature. Let us open not the book of Aristotle but that of nature, and turn the pages not only of the former but above all of the latter. To sum up the nature of true philosophy: let us turn to the nature of things, seek for the causes there, perceive the causes that we find, prove the perceived causes with other samples... and thus admire, know and venerate in nature the almighty, wise and good Maker of Nature.²⁰⁸

This too is a clear attempt at redefining. The Book of Nature has become an autonomous object of study, which should be deciphered not primarily on the basis of biblical texts and scholastic hair-splitting, but using the contemporary instruments of natural philosophy. According to Heereboord, not only the Bible but also philosophy was of divine origin, but it differed from theology in that it reached its object by means of natural reason and not by means of revelation. Later Heereboord claimed that, independently of the biblical text, humanity had an innate notion of God's existence, which could be powerfully nourished by studying the Creation, 'the Book in which we can read God'. The flood of biblical references with which this thesis was traditionally buttressed is lacking here. The door to natural theology had been set wide open.

Although he was not a practising researcher, Heereboord's oration is typical of the changing status of natural philosophy vis-à-vis theology. Partly under the influence of the Cartesian programme, a growing number of Dutch professors no longer assigned a purely auxiliary

²⁰⁶ Senguerdius, Oratio de vero philosopho, 23; Van Miert, Humanism in an Age of Science, 229.

 $^{^{207}}$ McGahagan, $\it Cartesianism, 217–243;$ Malusa, 'Historia Philosophica'; Krop, 'Scholam naturae ingrediamur'.

²⁰⁸ Heereboord, *De varia, vario tempore, et variis usitata, ac vera tandem Philosophandi ratione* (Leiden 1641). The text by Heereboord is lost; fragments are included in: Heereboord, *Meletemata philosophica...editio altera* I, 'Epistola dedicatoria'.

²⁰⁹ Heereboord, De notitia Dei naturali in: Idem, Meletemata I, 21-26.

task to philosophy. Philosophy—natural philosophy—became a fully fledged, independent discipline with a domain and methodology of its own. Of course, this emancipation was not without its problems, and the defenders of scholastic Aristotelianism were filled with fear and anger at the sight of how the Cartesians threatened to subordinate traditional religious certainties to rationalistic speculations. The result was a conflict that raged for decades, mainly in Utrecht and Leiden. In spite of the pro forma bans on Cartesianism and the infuriated reactions of the orthodox sector of the country, the governing bodies of the Dutch universities had no alternative but to recognise the new situation: theology and philosophy each had their own terrain, and the professors in these disciplines should respect these boundaries. To avoid polarisation, appointments were often good examples of the much praised Dutch culture of discussion.²¹⁰ Within both the theological and the philosophical faculties, traditional Aristotelians were given appointments alongside scholars with a more 'modern' orientation. The two faculties were thus not monolithic blocs, but each was a noisy symbiosis of Voetians and Cartesians. It would thus be incorrect to see the debate on the interpretation of the Book of Nature as a struggle between 'the' theologians and 'the' natural philosophers.

In short, partly as a result of the consolidation of natural philosophy as an independent discipline, the traditional parallelism between the Bible and the Book of Nature was called into question, both within and outside academic circles. According to a growing number of Dutch scholars, God's second book did not have to be explained in terms of the first, but on the basis of independent natural scientific and rationalistic insights. The latter could have far-reaching consequences, and could even lead to denial of the existence of a *liber naturae* at all. Descartes had maintained a telling silence on the subject, but a radical follower of the French philosopher, the highly sceptical physician Cornelis Bontekoe (ca. 1647–1685), was explicit about it.²¹¹ Bontekoe distinctly separated theology from philosophy. The idea that we can learn religious lessons from the Book of Nature has no foundation, Bontekoe claimed, even though everyone used the metaphor:

²¹⁰ Cf. Frijhoff and Spies, 1650: Hard Won Unity, 68.

²¹¹ On Bontekoe: Thijssen-Schoute, *Nederlands cartesianisme*, 276–315; Cook, *Matters of Exchange*, 293–298; Israel, 'Bontekoe's Views on Spinoza'.

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Even our preachers, as though the book of Scripture was not enough to teach God's church, have the habit of also resorting to evidence which they claim to draw from the book of Nature, which, to be serious, is like saying from the book of Drivel.²¹²

Bontekoe's position, however, was an extreme one and set him outside the debate on the Book of Nature. Spinoza, whose axiom Deus sive Natura (God, or Nature) ruled out any theory on the two books of God in advance, did the same.²¹³ Many other scholars who were influenced by Descartes, such as Balthasar Bekker and Johannes Swammerdam, nevertheless continued to use the metaphor of the two books. Inspired by the intellectual challenges of their day, they gave the old metaphor a new content. Their ideas were situated within the framework that Heereboord had already suggested: the Book of Nature was an independent magnitude, and should in the first instance be studied using natural scientific instruments instead of exegesis. Precisely this led to admiration for the almighty architect. In addition to the Bible but relatively detached from it, the wisdom and providence of the Creator could be seen in the variety and underlying order of nature. The increasing emphasis that came to lie on arguments that had already been advanced by Cicero, Pliny and Galen reached its apotheosis in the physico-theology of the eighteenth century.

The Bible as a problematic text

According to Reformed orthodoxy, the letter of the Bible was the only key to the reading of the Book of Nature. This was suggested in the Belgian Confession, made explicit in Maresius' commentary on that text, and put into practice by practitioners of Mosaic physics and supporters of the Second or Further Reformation. Among the latter circles a passionate opposition thus emerged to the separation of God's two books that the advocates of the new philosophy proposed. A reading of the Book of Nature that was not sanctioned by the Bible was a form of natural theology that would irrevocably lead to materialism, deism, and even atheism. It was only possible to know the Saviour through the divine revelation.

Voetius and his followers had only one instrument to counter the growing tendency to regard the *liber naturae* as an autonomous object

²¹² Bontekoe, Alle de werken, 3.

²¹³ Cf. Lagrée, 'Le thème des deux livres'.

of study: the dogma that the Bible is the alpha and omega of all natural philosophical knowledge. Holy Scripture interprets the Book of Nature, not vice versa. There can be no question of dialectic. The key to the explanation of the Holy Scripture lies in Holy Scripture alone, and not in external instruments such as human reason or philosophical writings. In other words, Voetius tried to rejuvenate the relation that had existed in Mosaic physics at the beginning of the seventeenth century. The emphasis that the Voetians placed on the timeless, literal character of the Holy Scripture was the source of an endless number of conflicts regarding the interpretation of natural phenomena.

The polemics that the Voetians waged with the Cartesians in the middle of the seventeenth century on such diverse subjects as the question of whether animals have a soul, whether there were mules on the sixth day of the Creation, or on the explanation of the 'heavenly signs' that the Bible referred to, all went back to a single basic problem: the relation between the biblical text and natural philosophy. The debate on Copernicanism that arose around 1640 is instructive in this respect.²¹⁴ The ingredients of this discussion were a book that was barely a century old and passages of the Bible that were thousands of years old. In 1543 Copernicus had revived a forgotten Greek theory by arguing in his De revolutionibus that the earth revolved around its axis every day and around the sun every year. It was the sun, not the earth, that was the unmoving centre of the universe. This was entirely at odds with traditional insights in physics and above all with such passages of the Bible as Joshua 10:12-13 describing the battle during which the sun and moon stood still, or the words on the sun in *Psalm* 19:6: 'His going forth is from the end of the heaven, and his circuit unto the ends of it'. Until the debate on Descartes broke out, there were hardly any Copernicans in the Dutch Republic (with the exception of Stevin and Lansbergen). The debate on Descartes, however, accentuated the contrast between exegesis and natural philosophy. The Voetian camp resolutely rejected Lansbergen's argument that the Bible refers to a moving sun because it looks as though it moves through the sky. For the Voetians, the passages in question had to be understood literally. Basing their arguments on the physical truth of the heliocentric theory, the Copernicans claimed that the biblical passages at issue could not be explained literally, but should be interpreted bearing in mind that the

²¹⁴ Vermij, Calvinist Copernicans, 137–322.

Bible sometimes adopted the usage of the common people. This was implicit in their position from the first, and was explicitly formulated by Christophorus Wittichius (1625-1687)—which was all the more significant since he was a theologian. In 1653 Wittichius published a tractate in which he criticised the use and abuse of biblical passages in natural philosophical debates in general, and in the debate on Copernicanism in particular.²¹⁵ In his view, the Bible was a purely theological text which consequently contained no physical information. When it did mention nature, it was referring to the limited spiritual capacities of the peoples. The Voetians responded furiously. The venomous academic debate acquired a public character in 1655 in connection with a small treatise in Dutch by the Utrecht Cartesian Lambertus van Velthuysen bearing the title Bewys, dat het gevoelen van die genen, die leeren der Sonne stilstandt, en des aertrycks beweging niet strydich is met Godts Woort (Proof that the perception of those who teach the immobility of the sun and the movement of the earth is not in conflict with God's word).²¹⁶ This brought the discussion into the street. A heated debate in churches, lecture halls and pamphlets was the result. In the last resort the debate was not about the astronomical arguments but about the explanation and status of the Holy Scripture and of Cartesian philosophy.

The problem of heliocentrism is a good indication of the shifting relations between the Bible and the Book of Nature. It concerned not only the changing conception of the *liber naturae*, but also the question of the key to its interpretation. The seemingly simply relation between two constant magnitudes had gradually turned into a complicated comparison between a number of variables.

Was the Bible really the unshakeable foundation by which the shifting interpretation of the Book of Nature could be kept under control? Unfortunately for Voetius and his supporters, this axiom came under fire from several quarters. It is very important to emphasise that the attacks did not come from Cartesians alone. The Voetians hardly realised that they were fighting a battle on several fronts against opponents of different persuasions, for the Dutch Republic was not only fertile ground for natural philosophy, but it also proved to be highly

Wittichius, Dissertationes duae de usu et abusu scripturae. See: Vermij, Calvinist Copernicans, 256–271.
 [Van Velthuysen], Bewys. See: Vermij, Calvinist Copernicans, 272–294.

stimulating for biblical hermeneutics. A variety of philologists and theologians such as Joseph Scaliger, Isaac Vossius, Johannes Cocceius, Lodewijk Wolzogen and Balthasar Bekker each made an individual contribution to a more historico-critical approach to the Holy Scripture. Already decades before the publication of Spinoza's Tractatus Theologico-politicus in 1670, the conviction was held in certain circles that the Bible was not a book full of timeless truths, but the product of an earlier culture, with all the problems of interpretation that that entailed. Some scholars went exceptionally far in their research and criticism. The philological activity that had been critically evaluating the works of Aristotle, Ptolemy, Pliny and Galen since the fourteenth century did not respectfully stop at the last bastion, the Bible. The word of God, as the philologist Isaac Vossius rather disrespectfully put it in 1659, was not a text that came straight from heaven, but a compilation of sometimes highly contradictory writings which, moreover, had suffered badly from the passage of time. 'The word Bible', the Spinozist Adriaan Koerbagh (1632-1669) scornfully remarked in 1668, 'is a bastard Greek word which means a book in general, no matter what kind of book it may be, whether Renard the Fox or Till Eugenspiegel'.217

The questioning of the authority of the Holy Scripture is particularly important here because it was crucial for the relation between the Bible and the Book of Nature. For a long time the emergence of biblical criticism in the seventeenth century was exclusively attributed to external factors, namely the rise of rationalism. That view has been disputed, at least with respect to developments in the Dutch Republic. We are in fact confronted with a number of factors, and radical biblical criticism was largely the result of a development that was internal to exegesis. It was the paradoxical but in fact logical consequence of Protestantism and humanism, both of which emphasised the importance of individual study of the Holy Scripture.

 [[]Koerbagh], Een bloemhof, 95. On Koerbagh: Wielema, 'Adriaan Koerbagh'.
 Cf. Allen, Legend of Noah; Scholder, Ursprünge und Probleme; Israel, Radical

Enlightenment.

219 Rooden, Theology, Biblical Scholarship and Rabbinical Studies, 145; Nellen, 'Growing Tension'; Jorink, "Horrible and Blasphemous".

²²⁰ Eisenstein, Printing Press, 303–452; Bentley, Humanists and the Holy Writ; De Jonge, Van Erasmus tot Reimarus; Evans, Problems of Authority; Norton, History of the Bible.

This emphasis on individual understanding of the Bible led to two closely related but eventually mutually opposed developments. On the one hand, logocentrism lay at the foundation of the conceptions of the Book of Nature that prevailed in the Netherlands, namely the biblicism of the Voetians. On the other hand, it was the basis for a more critical attitude towards the text. The study of the original Hebrew and Greek texts of the Bible, which commenced at the beginning of the sixteenth century, opened up an endless number of debates. Sometimes they were about important matters, such as when the word *logos* in the first line of the Johannine gospel ('In the beginning was the word') was rendered not by verbum but by the more dynamic term sermo in the translation of 1516 by Erasmus. While verbum refers to a single word, sermo refers to extended speech. There is quite a difference: was there a single, creative word in the beginning, or was God continually speaking?²²¹ At other times these debates were about matters of lesser import, though they still provoked a good deal of brain-cudgelling.

The passages on the Creation are important in this connection. It is illustrative that when Luther was working on his translation, he complained that he had great difficulty in finding the right German equivalents for the Hebrew and Greek names of biblical animals.²²² For a long time translators of the Bible and naturalists had had the greatest problems in relating biblical flora and fauna to the world and terminology of their own day.²²³ The extremely influential Historia animalium by the Protestant philologist and physician Conrad Gessner, which was published between 1545 and 1555, should be seen in this light.²²⁴ The Historia animalium sacra (1612) by Wolfgang Franzius (1564-1628), professor of theology in the Protestant bulwark of Wittenberg, was also extremely popular. 225 Franzius discussed almost every animal mentioned in the Bible and tried to identify them all. All the same, generations of philologists and translators of the Bible were to continue to struggle with the problem (which has not yet entirely disappeared either). What kind of animal was Leviathan or Behemoth?

²²¹ Jarrott, 'Erasmus' In principio erat verbum'; O'Rourke Boyle, Erasmus on Language, 3-31.

²²² WA II, 630.

²²³ Reeds, 'Renaissance Botany'; Dannenfeldt, 'Wittenberg'.

²²⁴ Gmelich-Nijboer, *Conrad Gessner's 'Historia Animalium'*; Ashworth, 'Natural History'.

²²⁵ Éranzius, *Historia animalium sacra*. See: Bäumer-Schleinkofer, 'Biblische Zoölogie'; Roggen, 'Biology and Theology'.

Was the Hebrew re'em (see e.g. Numbers 23:22; Psalm 92:10) correctly rendered by the word 'eenhoorn' (unicorn), as it appears in the first edition of the Dutch Authorised Version (the Statenvertaling) of 1637? No, was the reply of the Middelburg preacher Johannes de Mey, for example, in his *Physiologia sacra*; the beast in question was the more prosaic aurochs (urus).²²⁶ Around 1630 the preacher and philologist Abraham van der Mijle, a student of Danaeus and a friend of Gerardus Vossius and Hugo Grotius, asked himself to what extent all the unfamiliar animals from the New World fitted into the biblical chronology of the Fall, the Flood and the Tower of Babel. Had they also floated in Noah's ark? It was a complicated question, which was only explicitly raised in Van der Mijle's De origine animalium et migratione populorum (On the origin of animals and the migration of peoples), which was posthumously published in 1667.²²⁷ Works such as those of Van der Mijle, De Mey, Gessner, Franzius and the Huguenot Samuel Bochartus, author of the impressive Hierozoicon (1663), brought together the insights of both philology and natural history in an attempt to arrive at identification and description. These works can be regarded as concordances to the Book of Nature. They evidently met a demand. On the one hand they coloured in the picture of biblical and non-biblical natural history, on the other hand they led—unintentionally—to the conclusion that the extant biblical texts were far from clear.

A related problem was raised by the apparent natural philosophical contradictions or inaccuracies in the Holy Scripture. Those who adhered to the principle that the Bible could only be explained on its own basis sometimes came into serious conflict with accepted physical insights or common sense. This perhaps did not apply to the controversial passages which mentioned an immobile earth and a moving sun. It is understandable that these were the object of discussion: the biblical passages certainly were hard to reconcile with the contratiuitive speculations of the Copernicans. Still, even apparently more trivial passages provoked debate. 'Give ear, O ye heavens, and I will speak; and hear, O earth, the words of my mouth', ran *Deuteronomy* 32:1. A strictly literal interpretation did not seem appropriate here. How was one to interpret *Acts* 27:27, which in the translation of the

²²⁶ De Mey, *Physiologia sacra*, 174–180.

²²⁷ Van der Mijle, De origine; Hooykaas, 'Van der Mijle'; Meertens, Letterkundig leven, 334–340.

Dutch Authorised Version stated that 'the shipmen deemed that some country was drawing near to them'? This implied that the ship was stationary while the land moved. Two controversial verses were Genesis 1:6 and Psalm 148:4, which both spoke of waters situated above the heavens. Did this really mean that there were seas or oceans in the sky? In short, there was no lack of material to provoke conflict on exegetical principles. Calvin had already explicitly stated that the Bible sometimes accommodates itself to everyday usage and human intellectual capacities; sometimes the prophets spoke to be understood by the common people (ad captum vulgi).²²⁸ That there are waters above the sky is after all in conflict with common opinion and completely incredible, Calvin stated in his commentaries on Genesis and Psalms; the reference must be to clouds. He rejected those who adhered too slavishly to the letter, since Moses and the prophets had made use of common forms of expression in their language in order to be understood even by the most ignorant.²²⁹ These kinds of commonsense arguments were resolutely rejected by the Voetians. They persisted with their strictly literal interpretation and refused on principle to adjust their explanation of the Bible to non-biblical factors.

Paradoxically enough, their opponents acted more in the spirit of the Genevan reformer. First come the Cartesian philosophers and theologians, who made use of the principle of accommodation to create room for their own ideas, such as Copernicanism.²³⁰ Wittichius' controversial book explicitly referred to this form of hermeneutics. The Cartesians found allies among the supporters of the Leiden theologian Johannes Cocceius (1603–1669), who favoured a more metaphorical interpretation of the Bible, though for very different reasons. They too engaged in prolonged polemics with the Voetians. The roots of their type of exegesis lie in theology and trilingual philology and not, as it was once claimed, in rationalism. Cocceius' hermeneutics has to be seen against the background of his theology of the covenant, which remained aloof from philosophy and was strictly theological. In practice this meant that Cocceius and his supporters, unlike the Voetians,

²²⁸ Bouwsma, *Calvin*, 93–109; 118–127; Schreiner, *Theatre of His Glory*, 15–28; Greene-McCreight, *Ad litteram*.

²²⁹ Calvin, *Institutes* I, XIV, 3.

²³⁰ Vermij, *Calvinist Copernicans*, 239–332; Hooykaas, *Rheticus' Treatise*; Dibon, 'Connaissance révélée'; Van der Wall, 'Orthodoxy and Scepticism'.

approached the Word of God as a historical document.²³¹ The Old Testament was not a book full of timeless truths, but above all an allegorical history that foreshadowed the New Testament. The Cocceians contested the very strict Sabbath observance of the Further Reformists. The fourth commandment was a temporary commandment for the people of Moses, and should be interpreted as a prefiguration of the law of Christ. An acrimonious debate with the Voetians, better known as the Sabbath controversy, was the result.²³²

Cartesianism and Cocceianism had little in common, except that they were both 'new'. Philosophers and theologians respected one another's domains. The relation between Cartesians and Cocceians must therefore be seen as a strategic alliance, not a meeting of kindred spirits. It is important in this connection to note that Cocceius' hermeneutics offered a theological basis for a more figurative or allegorical interpretation of the Bible. De Mey, an eclectic influenced by Cocceius among others, remarked, for example, that *Deuteronomy* 32:1 ('Give ear, O ye heavens, and I will speak; and hear, O earth, the words of my mouth') was intended metaphorically: 'it is a known fact that neither the heavens nor the stars or the earth have ears or mouths'.²³³ When Balthasar Bekker contradicted Voetius on *Luke* 21:11 to claim that comets were not signs of God's wrath, he explicitly referred to the principle of accommodation of 'the two great interpreters of the scriptures, Calvin and Cocceius'.²³⁴

However, in the long run it was probably not the natural philosophers and theologians who contributed most to the debate on the status of the Bible, but the humanists and philologists. Their primary interest lay not in the exegesis of words, names or passages, but in linguistic problems. Grammar, syntax, possible corruptions, internal consistency and dates: those were the issues that concerned them. They avoided the use of the Bible as a collection of isolated pieces of evidence for doctrinal claims, but tried to set the Holy Scripture in its literary and historical context. In principle they approached it just like any other extant ancient text. The vastly improved knowledge of Greek, Hebrew and other Oriental languages that had taken place since the days of

²³¹ Van Asselt, Cocceius.

²³² Visser, Geschiedenis van de sabbatsstrijd; Israel, Dutch Republic, 662-664.

²³³ De Mey, Al de Nederduitsche wercken, 494–495.

²³⁴ Bekker, Ondersoek, 93.

Erasmus contributed to a better understanding of the world in which the Bible had been composed.

An absolute giant in this field was Joseph Justus Scaliger (1540-1609), who was the brightest star in the firmament of Leiden University from 1593 until his death.²³⁵ He coached such promising students as Daniel Heinsius, Hugo Grotius, Johannes de Laet and Willebrord Snellius. Besides his native French, he knew Latin, Greek, Hebrew, Arabic, Aramaic, Syrian, Persian, Turkish, German, Italian and some Dutch. He was also a pioneer in the field of Gothic, Samaritan and Ethiopian and, more generally, in comparative linguistics. He was furthermore an expert in chronological calculations. His most influential work was in chronology, that highly erudite discipline that played such a crucial role in early modern intellectual culture.²³⁶ It was an essential aid for the theologian who read the Bible, the physician who studied Galen, and the naturalist who read Pliny. Knowledge of chronology was a conditio sine qua non for a proper understanding of the Book of Nature as Dutch scholars conceived it in the first half of the seventeenth century. Scaliger already published his revolutionary De emendatione temporum in 1583. During his Leiden years he completed his magnum opus, the Thesaurus temporum (1606). This hefty tome offered a precise date for every major event in Christian history: the Creation, Fall, Flood, Tower of Babel, Joseph's flight to Egypt, and all the other episodes in the history of God's chosen people. In itself this was nothing new, as chronologies had been compiled on the basis of the Bible before, but they raised problems on a number of points. The innovative feature of Scaliger's approach was his use of external resources such as astronomical calculations of solar years and above all non-biblical sources to resolve inconsistencies. 'For Scaliger', Grafton has written.

chronology is to some extent no longer subservient to religion. It aims not to find a moral order in the past, but simply to reconstruct that past; it employs not merely the one divinely-inspired source, but all sources. Most important, it is based on a philological method which applies equally to Hebrews and to Greeks, to the Bible and to the ancient historians.²³⁷

²³⁵ Grafton, *Scaliger*; De Jonge, 'Scaliger in Leiden'; Breugelmans and Hoftijzer eds, *Adelaar in de Wolken*.

²³⁶ Grafton, 'Rise and Fall'; Idem, Defenders of the Text, 104-144.

²³⁷ Grafton, 'Rise and Fall', 169–170.

This principle led on the one hand to a much more reliable biblical chronology, but on the other to an apparently minor but potentially enormous problem. According to one of the non-Christian histories studied by Scaliger, the *Tomoi* by the Egyptian priest Manetho (third century BC), which he regarded as authentic and very reliable, the dynasties of the pharaohs went back centuries before the date on which Scaliger had determined the completion of the Creation (25 October 3950 BC). Were there people before Adam? Scaliger wisely left the explosive implications of his discovery untouched, but his emphasis on the equiponderance of biblical and non-biblical histories was bound to have far-reaching consequences at points where they contradicted one another.

There were a number of worrying issues. When Scaliger also subjected the text of the New Testament to critical analysis, he drew the conclusion that the attribution of seven of the twenty-seven books, including *Revelation*, to disciples or apostles was dubious.²³⁸ He also considered the account of the death of John the Baptist in the gospels according to Mark (6:14-29) and Matthew (14:1-2) to be questionable because they seemed to be at variance with an important contemporary source, Flavius Josephus. Scaliger did not publish these shocking findings, but did indicate a direction for future research. Biblical and non-biblical sources were often approached on the basis of equiponderance and studied with strict philological methods. The Leiden professors, some of whom had been trained by Scaliger, improved their knowledge of the Greek and Hebrew biblical writings and wrote annotations and commentaries on them. The Groningen historian Ubbo Emmius (1547-1625) stated that the dynasties of the pharaohs preceded the Flood, though without mentioning Scaliger by name.²³⁹ In other respects the situation remained relatively calm until roughly the middle of the seventeenth century.

And then all hell broke loose. In 1655, when the intellectual war between Cartesianism and Copernicanism had reached its climax, Elsevier published an anonymous book in Amsterdam that had already been circulating in manuscript form in Paris for decades: Isaac la

²³⁸ De Jonge, Erasmus, 10; Idem, 'Scaliger's De LXXXV Canonibus Apostolorum Diatribe'.

²³⁹ Emmius, Opus chronologicorum novum; see Vermij 'Emmius en de chronologie'.

Peyrère's Preadamitae. 240 The work was put on the market in no less than five different simultaneous editions.²⁴¹ La Peyrère (1596–1676) is today overshadowed by Descartes, Spinoza and their followers, but his contemporaries put him in the same category. It was La Peyrère who set off the bomb that Scaliger had discovered. According to the imaginative French writer the earth and its inhabitants must be much older than was assumed. The antiquity of the pharaohs, the presence of unknown peoples in America, and many other problems could be solved on the hypothesis that Adam was not the first human. La Pevrère went even further: he rejected the notion that the Bible contained the history of all humanity, advanced rational explanations for biblical miracles, claimed that Moses could not have written the Pentateuch since it contains an account of his death, argued that the texts of other books in the Bible were not authentic either, and announced some other ideas that anticipated Spinoza's Tractatus. Taken as a whole, it was a heretical doctrine of mammoth proportions. Preadamitae was based on a not very thorough reading of Scaliger's De emendation temporum, discussions with his libertine follower Claude Saumaise (1588–1653), and ethnographic material culled from the whole world. A mixture of common sense and naivety did the rest: Where did Cain's wife come from? It was a question that must have occurred to other contemporaries, but no one had openly raised it before La Peyrère. He thereby started a process that was eventually to transform the Bible from a holy to a profane book. The Holy Scripture was no longer regarded by sceptics as God's revelation, but as a collection of stories about the wanderings and customs of the primitive Hebrews, which were comparable with those of other ancient peoples of the Near East.²⁴²

La Peyrère was the *enfant terrible*. The responses to his work were bound to be furious. Dutch theologians, including Maresius, immediately reached for their pens to combat it.²⁴³ The Voetian camp saw a striking parallel between the Cartesians and the defenders of the Pre-Adamite theory. There were 'good grounds for suspecting' that 'a major Cartesian' had been involved in the publication, which is not entirely

²⁴⁰ [La Peyrère], *Praeadamitae*. See Rossi, *Dark Abyss*, 132–137; Popkin, *La Peyrère*; Grafton, *Defenders of the Text*, 204–213; Jorink, "Horrible and Blasphemous"; Idem, 'Noah's Ark Restored (and Wrecked)'.

²⁴¹ Doedes, 'Vijf drukken'.

²⁴² Popkin, La Peyrère, 73.

²⁴³ Hilpertus, Disquisitio de praeadamitis; Hulsius, Non-ens prae-adamiticum; Maresius, Refutatio fabulae prae-adamiticae; Schoock, Diluvium Noachi universale.

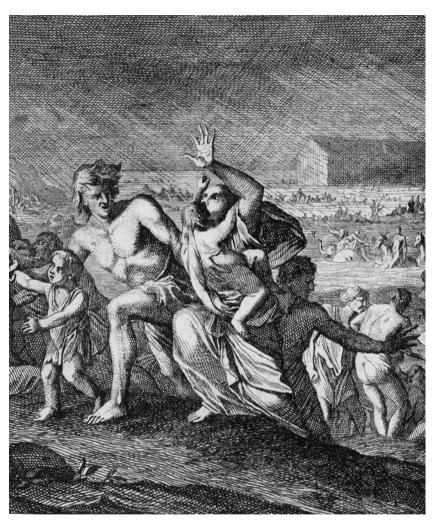


Fig. 13. The biblical lines on the Flood provided the key to the understanding of the dispersion of peoples, flora and fauna around the world. This engraving is taken from Jan Luyken, *Schriftuurlyke geschiedenissen* (1712).

unlikely given the fact that La Peyrère spent a long period in the Dutch Republic in 1655.²⁴⁴ Led by Voetius, the Utrecht theological faculty issued a report on 3 November 1655 which summed up the 'many dangerous theses' of this work for the benefit of the lay authorities. The most offensive was the heretical notion 'that we no longer have the authentic books of the writers acting under divine inspiration, but only a few dark copies'. 245 A few days later the Utrecht city council proclaimed a local ban on the book.²⁴⁶ The case was then taken to the Dutch parliament and the Court of Holland. Although parliament was usually extremely reticent with regard to the censorship of books, within three weeks it promulgated a national ban on this scandalous and godless book 'containing horrendous and slanderous opinions, in direct opposition to God's holy word...and tending to mislead the subjects of this state and all other followers of the Christian religion'. 247 The Court of Holland adopted similar language and emphasised that it was an attack on 'the foundations of Christian religion'. 248 Nevertheless, the ban must have aroused curiosity, and even a Dutch translation of the work appeared in 1661.²⁴⁹

The discussion on the exclusive status of the Bible as the key to world history was now out in the open. Besides the bitter conflicts on Cartesianism and Cocceianism, there was now general concern about what was perhaps the inevitable result of the humanist return to source criticism and, in particular, Scaliger's chronological calculations. Numerous sources bear witness to the fear that arose among the clergy around 1656 regarding the 'assault on the authority of the Holy Scripture'. The Dutch parliament sent Leiden University an urgent Order against the mixing of theology with philosophy and the abuse of the freedom to philosophise to the detriment of the Scripture, considering that the two disciplines must be kept strictly separated from one another. In matters regarding the Book of Nature, the theologians had the last word:

²⁴⁴ 'Suetonius Tranquillius', Overtuyghden cartesiaen, 7. See also Idem, Verdedigde oprechticheyt, 12.

²⁴⁵ 'Advis der Theologische faculteijt tot Utrecht', published in: Kleerkooper and Van Stockum, *Boekhandel in Amsterdam* I, 216–217.

²⁴⁶ Kernkamp ed., Acta et decreta I, 316.

²⁴⁷ Groot Placaet-boeck 1657 II, 2224, 2225; See also: Resolutiën 88 (1655) 390, 396.

²⁴⁸ Kleerkoper and Van Stockum, *Boekhandel*, 217.

²⁴⁹ [La Peyrère], Praeadamiten.

²⁵⁰ Knuttel ed., Acta der particuliere synoden III, 517.

...although the things that God himself has revealed in his word and some of his works, including nature, can be known, some more than others, they can be understood and comprehended much earlier, more easily, more securely and certainly on the basis of God's word itself than by and from natural reason.²⁵¹

If philosophy seemed to contradict theology, scholars must

above all abide by the supreme rule that what God the Lord has revealed to men in the Holy Scripture must be held to be the most sure, reliable and unquestionable.

The influence of Article II of the Belgian Confession and the ensuring theological dogmas are clearly at work here. The *Order* was primarily intended to confine the problems connected with Cartesianism, but the concern caused by the Pre-Adamite theory and, more generally, the attack on the authority of the Holy Scripture must have played an important role in the background too. In spite of all the commotion and censorship, however, a number of Dutch scholars continued resolutely with their critical research on the biblical text.

Prominent among these was Isaac Vossius, who was relatively free to set down his ideas because he did not hold a university position.²⁵² For a long time he was a rather neglected figure. The only son to outlive his father, the great scholar Gerardus Johannes Vossius, Isaac was educated by his father and by Saumaise. He went on a long study tour of libraries in Europe before being appointed as librarian to Queen Christina of Sweden. In 1655 he settled in The Hague, living from sinecures and an allowance from Louis XIV. Vossius published a new edition of his father's De theologia gentili in 1668, which he dedicated to the influential French politician Jean-Baptiste Colbert. In 1670 he moved to England with his famous collection of books and manuscripts. He was appointed canon of Windsor by Charles II and could devote himself to study without interruption. As a young man, this protégé of monarchs had made a name for himself with his erudite editions of obscure classical authors. From 1655 on he manifested himself more as a polymath. He now wrote studies on the nature of light, the course of the River Nile, the nature of the wind and contemporary China with the same ease with which he tackled the construction of

²⁵¹ Molhuysen, *Bronnen* III, 57*.

²⁵² On Vossius see: Blok, *Isaac Vossius*; Katz, 'Isaac Vossius'; Jorink and Van Miert eds, *Between Scholarship and Science*.

the trireme or the Sibylline oracles.²⁵³ Already in his own day his wild ideas did not always meet with a favourable reception, and Charles II is even said to have remarked that Vossius believed anything as long as it was not in the Bible.²⁵⁴ While his pious father had oscillated between revealed and natural theology, Isaac seemed to inhabit the twilight zone between scepticism and atheism. As Grafton recently put it: 'while Gerardus had built bridges, Isaac burned them."255 However, many of his learned contemporaries regarded Vossius as a genius like that other famous son of a scholar from Holland, Christiaan Huvgens. 256 In the early 1660s they both frequented the Parisian academies of Montmor and Thévenot-forerunners of the Académie Royale des Sciences established in 1666.²⁵⁷ The Royal Society, to which Vossius had been admitted as a Fellow in 1664, was treated in 1675 to his 'ingenious opinions' on the craters of the moon and the burning-mirrors with which Archimedes was supposed to have set fire to the Roman fleet at Syracuse.²⁵⁸ The treatises made such an impact that the secretary, Henry Oldenburg, begged Vossius to submit more samples of his erudition to the judgement of the society. 'What you to me personally hinted not long since about ballistic matters would (so I think) wonderfully please it'.259 In 1685 the Dutch East India Company asked for Vossius' advice on the tropical monsoons that posed such problems to navigation.²⁶⁰ Vossius kept a close watch on the flood of information, writings and artefacts from East and West, particularly from China, a country that he admired intensely.²⁶¹

The start of Vossius' career as a *soi-disant* polymath was marked by his *De vera aetate mundi* (1659).²⁶² This short treatise was published in Dutch in the following year with the subtitle 'in which it is demonstrated that the world is at least 1440 years older than is generally assumed'. The precise objectives of Vossius' book are unclear,

²⁵³ Vossius, *De lucis natura*; Idem, *De motu marium*; Idem, *De Nili origine*; Idem, *De Sibyllinis*; Idem, *Variarum observationum liber*.

²⁵⁴ Katz, 'Isaac Vossius', 142.

²⁵⁵ Grafton, 'Isaac Vossius, Chronologer'.

²⁵⁶ See for example: De Monconys, *Journal des voyages* II, 111–115.

²⁵⁷ Brown, Scientific Organisations; Hahn, Anatomy of a Scientific Institution, 3–10.

²⁵⁸ Birch, History of the Royal Society III, 192–193.

²⁵⁹ CHO XI, 208–209.

²⁶⁰ Gaastra, Bewind en beleid, 163–164; Zandvliet, Mapping for Money, 162–163; Davids, 'Vossius and Geography'.

²⁶¹ Pinot, La Chine, 202–207; Weststeijn, 'Spinoza sinicus'.

²⁶² Vossius, De vera aetate mundi.

but we should see it against the background of Scaliger's chronology and as a refutation of La Peyrère's work.²⁶³ The latter had uttered the bold statement that 'Egyptian kings' had reigned for millions of years. Vossius found this very improbable, as well as being at odds with the Pentateuch. He brought in the Tomoi of Manetho that Scaliger had presented and the Hebrew and Greek texts of the Bible, sources that La Pevrère, who was no great linguist, had ignored. Vossius, on the basis of his fabulous philological knowledge, and with the assistance of a large number of exotic and rather explosive sources such as the Chinese chronicles unlocked by Martino Martini in his Sinicae historiae (1658), now posited that the earth must be considerably older than the five and a half millennia that Scaliger had calculated. A new interpretation of the Holy Scripture enabled Vossius to project the Creation a further 1500 years back in time. With a measure of goodwill, this solved the problem of the Pre-Adamites, since Manetho's chronicle of the Egyptian dynasty fitted into and confirmed the new biblical chronology, but in fact the remedy applied by Vossius was worse than the complaint.

This was because, in his attempt to bring biblical and non-biblical history into harmony with one another, Vossius had scrutinised the books of the Pentateuch.²⁶⁴ More or less following La Peyrère, the philologist claimed that these were not the original texts written by Moses but copies which, like any other classical text, had been severely corrupted over the years. There was in principle no difference in status between the text of the Bible and other extant writings of antiquity. Vossius was therefore indignant at the 'contemporary Jews and Christians' who claimed with great resoluteness that the familiar Hebrew text had come directly 'from heaven'.²⁶⁵ In *De vera aetate* and the more extensive discussions that soon followed it, Vossius claimed that not the Hebrew Masoretic text but the Samaritan version that had been preserved in Greek was the most reliable copy of the books of Moses.²⁶⁶ The original, however, was no longer extant: 'although many utter them, the exhortations and threats do not deter me from

 $^{^{263}}$ Klempt, Säkularisierung der universalhistorischen Auffassung; Jorink, "Horrible and Blasphemous"; Grafton, 'Isaac Vossius, Chronologer'.

²⁶⁴ Lebram, 'Ein Streit'; Mandelbrote, 'Vossius and the Septuagint'.

²⁶⁵ Vossius, *Discours*, 12.

²⁶⁶ Vossius, De vera aetate; Idem, De septuaginta interpretibus; Idem, Appendix ad librum de LXX interpretibus.

openly presenting my observations'. 267 What remained, according to Vossius, was at most a copy of a copy of a translation, as the original Hebrew text had been burnt during the destruction of the temple in 70 AD. Following La Peyrère, Vossius also stated explicitly that the Bible did not narrate universal history but was merely the historical and locally circumscribed account of one people. The Egyptians, Chinese, Persians, Arabs and Ethiopians had their own chronologies too, which all went back some 7000 years in time and thus all fitted into the Vossian chronology. On the basis of these non-Christian histories, he rejected the universality of the Flood, asked how the strange animals of the New World had been accommodated inside the ark, and did not believe that all of the languages in the world were descended from Babel.

The implications of Vossius' work were enormous. A dramatic change to the perspective on world history seemed imminent. The traditional sequence of Creation, Flood and Babel, leading to the scattering of nations, languages, flora and fauna, was called into question. It is probably not fortuitous that these years witnessed the publication of Van der Mijle's *De origine animalium et migratione populorum*, which he had written around 1630. The dogma of monogenesis made way for an openly or covertly raised possibility of polygenesis. The sacred belief that had remained the only unshakeable principle in the doubt-tormented seventeenth century, the Bible, was now openly called into question by certain scholars. The attack did not just come from the Cartesian rationalists.

What now became clear in all its disturbing ramifications in the work of Vossius was in fact the consequence of a development that been announced in philology some time before. Unlike the volatile La Peyrère, Vossius was a philologist with an international reputation. Although his work was not banned, alarmed theologians, including Cocceius, were not slow to respond. Vossius was accused of being a secret follower of Pre-Adamite theory and of pronouncing heretical ideas. Still, the mischief had been done. As Grafton notes:

²⁶⁷ Vossius, *Discours*, 17.

²⁶⁸ Coccejus, Judaicarum responsionum et quaestionum consideratio; Hulsius, Authentia absoluta s. textus Hebraei; Schotanus, Diatribe de authoritate; Schoock, Diluvium Noachi universale.

²⁶⁹ Hornius, Dissertatio de vera aetate mundi, 2/r.

'Strong wits' across Europe gossiped enjoyably about the origins of Cain's wife and the authorship of the report of Moses' death in Deuteronomy. The most powerful of texts had tumbled down.²⁷⁰

This all took place in the decade preceding the publication of the betterknown works of the heretical trio of Lodewijk Meijer (Philosophia S. Scripturae interpres, published anonymously in 1666), Adriaan Koerbagh (Een Bloemhof, published under a pseudonym in 1668), and Benedictus Spinoza (Tractatus theologico-politicus, published anonymously in 1670). While La Peyrère's book had been immediately banned, the books of Meijer and Spinoza were not prohibited by parliament until a few years later.²⁷¹ These works are generally regarded as the result of a rationalism taken to the limit and as the start of a new tradition. 272 As a result of the geometric method, championed in particular by Spinoza, the authority of the text was now subordinated to reason. However, there are good reasons to regard the ideas of Spinoza in particular from the perspective of the much more philologically orientated Bible criticism of La Peyrère and, above all, Vossius.²⁷³ For contemporaries, at any rate, the connection was obvious. For instance, the acute Voetian Jacobus Koelman (1631–1695) remarked: 'Spinoza has constructed the rejection of the authority of the books of Moses on the foundations erected by La Peyrère'.274

Whatever the precise relation may have been, the question of the status of God's revelation in the Holy Scripture and the related problem of the relation between the Creator and his Creation was at the heart of fierce debates well before 1670.

An interim balance

One of the foundations of Reformed orthodoxy in the Dutch Republic was the conviction that God could be known from the Bible and from the Book of Nature. The time-hallowed and relatively vague notion of the *liber naturae* was given a specific interpretation in the Netherlands. In spite of the claims of Galileo and others, the Book of Nature

²⁷⁰ Grafton, New Worlds, Ancient Texts, 242.

²⁷¹ Cf. Israel, 'Banning of Spinoza's Works'.

²⁷² See for example: Israel, Radical Enlightenment, 197–217, 275–285.

²⁷³ Cf. [Koerbagĥ], *Een Bloemhof*, 240; 292; 325–326; 405; 462–463; [Spinoza], *Tractatus theologico-politicus*, Chapters 1–12. Spinoza owned a copy of the *Praeadamitae*: see: Freudenthal, *Lebensgeschichte Spinoza*'s, 161.

²⁷⁴ Koelman, Het vergift van de cartesiaansche philosophie, 276.

was not considered in isolation in the Netherlands, but as one of the two books of God. As Jacob Cats, by far the most widely read Dutch writer, put it:

It has been put very well; God has two big books Where there is much to be found for those who seek... The first is the holy word, the second God's works In which everyone can marvel at the wonders For if they are judged equally The one teaches his will, the other his might.²⁷⁵

Revealed and natural theology merged seamlessly: speculations on the order and pluriformity of nature were sanctioned by the Bible. There was little problematic about this position until around 1650. Nature was generally considered by scholars to be a text that could be interpreted using philological instruments. Natural scientists used the Bible and the classics as the starting point for their reflections on the antiquity of the Creation, the place of the earth in the cosmos, the dispersion of peoples and languages, and the identity of flora and fauna. For a much wider group of theologians, poets and laymen, nature was a book of God from which his existence could be deduced. According to the orthodox, the Bible was the filter through which the Book of Nature had to be read. The influential Voetius took this viewpoint even further. External resources such as philosophy were taboo, since all necessary knowledge was encapsulated in the Bible. The Word of God was in principle a timeless and universal source of truths, and should be understood literally.

From about 1650 on this hermeneutic principle was increasingly called into question. Was the Bible the exclusive key to the Book of Nature? Was the understanding of God's Creation on the basis of the Holy Scripture and scholastic Aristotelianism as unproblematic as the supporters of Mosaic physics and the Further Reformation believed? These questions were the consequence not only of changing conceptions of the purpose and method of (natural) philosophy, but above all of the scrutiny of the extant texts of antiquity, in particular the Old Testament. The image of a scholarly world for which the Holy Scripture and the Book of Nature were stable factors gave way to pluriformity. The influential representatives of the Further Reformation clung to the conviction that the relation between the two books of

²⁷⁵ Cats, Alle de wercken II, 598-599.

God remained unchanged. At the other end of the intellectual spectrum were a few thinkers for whom these conceptions had become meaningless. Bontekoe mockingly referred to the Book of Nature as the 'book of Drivel', Vossius claimed that the original text of the Old Testament had been lost, and for Koerbagh the Bible had the same status as Renard the Fox. The Spinozists identified God with nature, so that the conception of the Book of Nature lost all meaning.

The majority of Dutch theologians, natural philosophers and other scholars nevertheless continued to take part in the discussion of the Book of Nature. They faced many challenges in mid-century. How was the Book to be defined? How was it to be interpreted? How could new conceptions of nature be set within a religious framework? In the light of philological discoveries and new natural philosophies, how could a debatable biblicism be avoided without lapsing into materialism or deism? In other words, using the resources of their day, independently of the biblical text that had been rendered problematic on so many points, how were they to study nature and at the same time demonstrate the providence of God and combat the dangers of atheism? This process will be examined in more detail in the following chapters on the basis of a number of case studies.

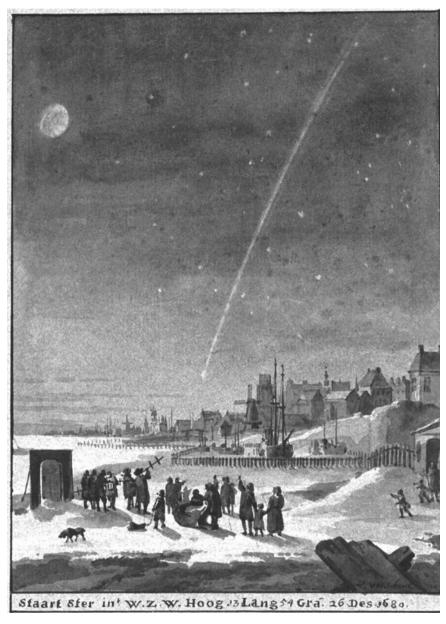


Fig. 14. The appearance of the comet of 1680 aroused a great sense of wonder, as can be seen on this water colour by the Rotterdam painter Lieven Verschuier (Rotterdams Historisch Museum).

CHAPTER THREE

COMETS: THE DEBATE ON THE 'WONDERS IN THE HEAVENS'

1. Introduction

A category of signs from the Book of Nature that particularly interested Constantijn Huygens comprised unusual celestial phenomena. Eclipses, circles of light (coronae) around the sun and especially comets attracted his attention and inspired him to write at greater or lesser length about them.1 For Huygens, such phenomena were not just fascinating aspects of nature; at times they also seemed to announce some supernatural message. For instance, Huygens was in the French town of Orange on 7 May 1665 to restore, after protracted talks with Louis XIV, the authority of the Dutch House of Orange. At the climax of the ceremony a corona was observed and caused great excitement. A few days later Huygens wrote an epigram in which he stated in no uncertain terms that heaven had apparently wanted to crown the bond between the townspeople and the House of Orange with this sign.² By the time of his autobiography thirteen years later, his ardour had somewhat cooled: 'It was a freak of nature, as I knew...But that nature caused the event to happen at that precise moment seemed to indicate something of an omen'. We find the same link between speculations about the physical earth and a possibly divine significance in the poem Cometen-werck, which Huygens composed in 1681 in connection with the appearance of a spectacular comet. Huygens expressed his astonishment at this enigmatic phenomenon, this 'fire of mysterious matter and exceptional elegance'.4 Did a comet have natural causes? Was it 'a harbinger of sorrow or of good fortune? I have not yet made up my mind'.5

¹ See for example: GCH III, 23–25; VIII, 255; OCCH III, 241–242.

² GCH VII, 82.

³ Huygens, Mijn leven I, 167.

⁴ GCH VIII, 260.

⁵ GCH VIII, 259

Huygens was certainly not the only one to grapple with such questions. The reactions provoked particularly by the appearance of comets in the early modern era were extreme all over Europe.⁶ Such signs in the sky could be seen in several years—1618, 1664, 1681, 1682—and numerous pamphlets, tractates, poems and illustrations bear witness to the astonishment, but above all the fear that they occasioned. The excitement has often been studied, but little is known about the highly interesting debate that took place in the Netherlands. Well-known authors such as Cats, Voetius, Witsen and Bekker were each to dedicate publications to the topic.7 It would be no exaggeration to claim that there is hardly any Dutch philosopher, theologian or poet who was not concerned in some way with the question of 'what this sign means'. Comets are bodies in the solar system with a relatively small mass which follow very elongated elliptical courses.8 The revolutions of these bodies, which consist mainly of frozen matter, vary from dozens to many millions of years. Proximity to the sun causes the release of gases, which are responsible for the characteristic tail that is always turned away from the sun. Some comets can be perceived by the naked eye, such as the Hale-Bopp comet, which was visible as a small speck in 1996. Historical sources indicate that they can also have enormous tails. Proximity to the sun caused the tail of the 1682 comet, later known as Halley's comet, to span 55°—that is, more than a quarter of the sky. Its long-awaited return in 1986 was an anti-climax, as Halley's comet was barely visible on that occasion.

These often impressive phenomena were already the object of speculation in Babylonian antiquity. The word 'comet' comes from the Greek astèr komètès, 'long-haired star'. Classical authors devoted extensive discussions to these phenomena, concentrating on the ill fortune that they were believed to presage. Until late in the seventeenth century, scholars referred to ancient sources to support the claim that comets were precursors of plague epidemics, wars, famines and other disasters (a word whose etymology likewise goes back to astèr, 'star').

The seventeenth century marked a watershed in this respect. Balthasar Bekker and Pierre Bayle (1647–1706) both sharply criticised the new wave of comet fear that had emerged after 1680. In their respective Ondersoeking van de betekenisse der kometen (Inquiry into the meaning of comets) and Pensées divers sur la comète, they argued that

⁸ Yeomans, Comets; North, 'Comets'.

⁶ See for example: Robinson, *Great Comet*; Hazard, *Crise*, 142–147; Genuth, *Comets*.

⁷ Jorink, 'Van omineuze tot glorieuze hemeltekens'; Van Nouhuys, *Two-faced Janus*; Fix, 'Bekker and Bayle'; Idem, 'Comets in the Early Dutch Enlightenment'.

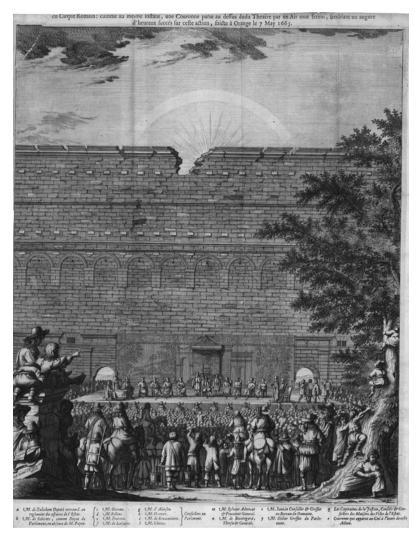


Fig. 15. A pamphlet commemorating the appearance of a corona during Constantijn Huygens' mission to the French town of Orange, on 7 May 1665 (KB).

comets did not have a supernatural meaning. The works of Bekker and Bayle are usually regarded as one of the starting-points of the Enlightenment.9 Another famous figure is the English astronomer Edmond Halley (1656-1742), who on the basis of observations carried out in

⁹ Hazard, Crise, 142-147; Colie, 'Rationalist Revolution', Israel, Radical Enlightenment, 333-334, 378.

1682, formulated the hypothesis that a comet was a periodic natural phenomenon. Using Newton's method, Halley calculated the course of this and twenty-three other comets, which he published as *A synopsis of the astronomy of comets* in 1705. The predicted return of 'his' comet was followed with bated breath throughout Europe, and proved the accuracy of his calculations.¹⁰

Since the Enlightenment, the discovery of the regular motion of comets and the eclipse of their ominous meaning can be seen as two sides of the same coin. Once scholars like Halley and Newton had discovered that comets followed natural laws, the fear of comets, it is assumed, soon disappeared. 'In cometary science Halley was at the watershed: before him comets were omens and portents', Hughes writes, 'afterwards they were predictable astronomical phenomena'.¹¹ In other words, the fact that a scientific explanation of their physical nature had been formulated (and later demonstrated to be correct) has been taken to have brought about the obsolescence of the 'superstition'. This is a specific example of the causal relation that has often been established between the so-called scientific revolution and Weberian disenchantment. As Andrew Fix writes:

The seventeenth century was a great turning point in European thought during which the Scientific Revolution and the early Enlightenment replaced the traditional European religious worldview with a new worldview based on empirical science and human reason. As the Aristotelian-Ptolemaic conception of the universe gave way to the Copernican heliocentric view, many ideas traditionally associated with the older cosmologies also began to change. A case in point was belief in comets as harbingers of disaster.¹²

This interpretation, however, is to a large extent the product of the rhetoric of the Enlightenment. It is rather debatable. Closer scrutiny reveals that there is hardly any connection between models to explain physical phenomena and changes in the conferral of meaning, and 'superstition' proves to be an extremely subjective concept. Consideration of the changing views of comets in terms of the discussion of the Book of Nature leads to a different picture.

Comets were not just a problem of natural philosophy, but had also been the subject of the more narrative *historia naturalis* since antiq-

Wagg, 'Expected Return'; Zuidervaart, 'Konstgenoten', 99-234.

Hughes, 'Halley', 324.

¹² Fix, 'Bekker and Bayle', 81.

uity. As such, the character of comets as prodigies was a historical and literary given down to late in the seventeenth century. Moreover, and this is crucial, they were traditionally interpreted on the basis of the Bible, which at several points mentions 'heavenly signs' given by God. When the character of comets as omens was raised for discussion in the course of the seventeenth century, this was in the first instance the result of a calling into question of the traditional analogy between these phenomena and the literary tradition, not of progress in astronomical knowledge. The changing conceptions of comets were above all the fruit of new exegetical and philological insights. Furthermore, in terms of the discussion of the Book of Nature, comets continued to be seen as divine signs, even though they were initially regarded as signs of God's wrath, before later becoming a summons to admire his works.

Cometae, monstra, prodigia

The fear of comets is only one facet of a much broader fascination with earthquakes, monsters, rains of blood, eclipses and so on that existed in the sixteenth and early seventeenth centuries.¹³ Interest in these supernatural or preternatural phenomena had a respectable tradition, but was stimulated to a large extent by the unrest that prevailed in Europe as a result of the Reformation. 14 Time and again political and religious events and the vicissitudes of war were brought into connection with all kinds of natural wonders. Every deviation from the natural order was interpreted without exception as a divine sign whose interpretation called for consultation of the corpus of classical and Christian texts, which constituted the starting point for all science.

Greek and Roman historians had often described how a defeat, the death of an emperor or an epidemic seemed to have been announced by an omen or prodigium, such as a monstrous birth, a rain of meteors, or anything else that somehow deviated from the natural course of things.15 An art of divinatio emerged in connection with these exceptional events. What is important is that all of these phenomena, irrespective of their nature, were regarded as signs. This is evident in the

¹⁴ Schilling, 'Zeichen der Endzeit'; Zambelli ed., 'Astrologi hallucinati'; Barnes, Prophecy and Gnosis; Ewinkel, De monstris.

¹⁵ Barton, Power and Knowledge; Rosenberger, Gezämte Götter.

¹³ Céard, La nature et les prodiges; Daston and Park, Wonders and the Order of Nature, 135-254; Webster, From Paracelsus to Newton; Niccoli, Prophecy and People.

Latin word for them, *monstra*, which is derived from the verb *monstrare*, 'to indicate, to announce'. The same character of being a sign can be seen in such synonyms as *signa*, *ostenta*, *praesagia*, *miracula*, or *portenta*.

Comets were thus just one of a much larger range of *prodigia*. Tacitus, for instance, writing on the reign of Nero (54–68), recorded that:

At the close of the year, [A.D. 64], report was busy with portents heralding disaster to come—lightening flashes in numbers never exceeded, a comet...; two headed embryos, human or of the other animals, thrown out in public or discovered in the sacrifices where it is the rule to kill pregnant victims. Again, in the territory of Placentia, a calf was born close to the road with the head grown to a leg; and there followed an interpretation of the soothsayers, stating that another head was being prepared for the world...¹⁶

Virgil, Lucan, Livy, Asconius, Suetonius, Cassius Dio and Claudian expressed themselves in similar words.¹⁷ The didactic poem *Astronomica* by Marcus Manilius, which Scaliger was to edit in 1579 and 1599, was also influential. Failed harvests, scorching heat, epidemics, corpses heaped on pyres: 'Such are the events often announced by flickering comets'.¹⁸ These were signs that the gods were angry, was the unanimous verdict of antiquity.

This does not mean to say that there was no interest in the more physical aspect of the matter. The Aristotelian *Meteorologia* and other sources show that a surprising number of philosophers engaged in profound speculation on the nature of these 'long-haired stars'.¹⁹ They came to very different conclusions. Hippocrates of Cos, for example, suggested that comets were optical illusions; for Anaxagoras and Democritus they were conjunctions of planets; while Xenophanes of Colophon regarded them as burning clouds. That the appearance of a comet was associated with a natural disaster was not at dispute, but the nature of that connection remained unclear.

Aristotle himself came up with a particularly influential explanation. He regarded comets as atmospheric phenomena, and therefore

¹⁶ Tacitus, The Annals 15.47.

¹⁷ For an extensive survey see: Gundel, 'Kometen'; Thorndike, *History of Magic*, passim.

¹⁸ Manilius, *Astronomica* I, 876–907; Montanari Caldini, 'Manilio tra scienze e filosofia'; Grafton, *Scaliger* I, 180–227.

¹⁹ Aristotle, Meteorologia I, vi, 342 b 25-343 b 35.

dealt with them, not in his cosmological works, but in his Meteorologia.²⁰ In his view, their origin lay in the earthly sphere. The outermost rim of this sphere consisted of warm, dry exhalations which sometimes caught fire because of the rotation: 'Then a comet is produced, its exact form depending on the form taken by the exhalation—if it extends equally in all directions it is called a comet or long-haired star'. 21 Much less common were superlunary comets, which were produced by exhalations of stars and planets.²² The proof that comets were fiery by nature lay in the fact that they were commonest in dry and windy years.

So Aristotle attributed natural causes to comets. In his system they were not divine signs of disaster, but coincided with floods, drought and failed harvests.²³ Later authors nevertheless paid less attention to the physics than to the significance of comets. Stoic-inspired writers such as Cicero, Pliny and Seneca were particularly influential. The Stoic philosophy of nature posited a direct link between the cosmic order and the moral order on earth. Nature was conceived as a medium between the divine and the human orders, and striking natural phenomena were always assigned a deeper meaning.24

Cicero, the unbaptised church father as he was later called, advanced several arguments for the existence of an innate human intuition of God in his De natura deorum. The third point was the terror that makes our hearts miss a beat when we observe natural wonders:

...earthquakes and occasionally subterranean rumblings, showers of stones and raindrops in the colour of blood...also unnatural monstrosities human and animal, and also the appearance of meteoric lights and what are called by the Greeks 'comets' and in our languages 'long-haired stars' such as recently during the Octavian War appeared as harbingers of dire disaster.25

Pliny too explored the nature of comets in greater depth.²⁶ He assumed that nature obeyed laws that were largely concealed from human intelligence. He paid more attention than Cicero to divinatio. In his view, a

²⁰ Ibid. I, vii.

²¹ Ibid. I, vii, 344 a 20.

²² *Ibid*. I, vii, 344 b 1–344 b 10.

²³ *Ibid.* I, vii, 344 b.

²⁴ Sambursky, Physics of the Stoics; Hahn, Origins of Stoic cosmology.

²⁵ Cicero, De natura deorum II, v.

²⁶ Pliny, Natural history II, 89–94.

comet was 'a heavenly body that generally sows panic and the disaster that it announced is not easy to avert'.²⁷ He proceeded to offer a classification in which the external appearance of the comet, the direction of its tail, and its place in the sky played a role. He also summarised the recent disasters that had been preceded by the appearance of a comet.

The most prominent advocate of the idea that nature was a purposive and signifying entity was Seneca. He devoted the entire seventh and last part of his Naturales quaestiones to comets. He began by complaining that people usually pay little heed to the beauty of the heavens. People only look up when something unusual is to be seen. 'The same thing happens in the case of comets. If a rare fire, and one of unusual shape appears, everyone wants to know what it is and, ignoring the other celestial phenomena, asks about the newcomer'.28 After dismissing earlier theories, Seneca goes on: 'I do not think that a comet is just a sudden fire but that it is among the eternal works of nature'.29 According to Seneca, comets move in accordance with regular laws and follow regular courses just like the planets. 'Some day' he wrote prophetically, 'there will be a man who will show in what region comets have their orbit, why they travel so remote from other celestial bodies, how large they are and what sort they are'. 30 However, Seneca too was quite unambiguous about the fact that comets had a divine meaning. In fact, it was precisely because they were celestial bodies that obeyed certain natural laws that they should be interpreted in the same way as stars and planets. Nature did not often show comets, which was why she wanted these heavenly bodies to draw attention to the greatness of her works. Since everything in nature was connected with everything else, each phenomenon referred to another. Comets too were a part of the causal chain of fatum and could therefore be regarded as omens of the future.

The Stoic view of comets was to form a constant undercurrent in Christian culture and to win influence in the seventeenth century. Until then, the synthesis that Ptolemy formulated was to play a dominant role.³¹ He connected Aristotelian physics with the more Stoically

²⁷ Ibid.

²⁸ Seneca, Naturales quaestiones VII, 1.5.

²⁹ *Ibid.* VII, 22.1.

³⁰ Ibid. VII, 25.7.

³¹ Taub, Ptolemy's Universe; Genuth, Comets, 23, 51-65.

orientated interest in divinatio. Although Ptolemy did not refer to Aristotle by name, he accepted his location of the comets in the sublunary sphere. This had far-reaching consequences. Ptolemy did not discuss comets in his authoritative work on mathematical astronomy, the *Almagest*, but in connection with other atmospheric phenomena in his astrological work, the Tetrabiblos.32 This work was to become one of the foundations of Western astrology, which was so inextricably intertwined with astronomy for so long.³³ In this connection it is important that, in the spirit of Aristotle, Ptolemy noted that the long-haired stars often appeared in connection with drought and other meteorological phenomena. Astrological techniques made it possible to deduce more specific consequences. Analogous to the position of the planets in the zodiac, predictions could be based on the place of the comet in one of the twelve zodiacal houses. The direction of the tail indicated the regions that would come under the influence of the comet. The period during which a comet could be seen was an indication of the duration of its effects. Its relative distance from the sun indicated at which point the catastrophe would commence.

Ptolemy's general system was often cited later, but it still left a good many questions unanswered. Specific predictions were made in the collection of astrological aphorisms known as the Centiloquium, and which were attributed to the Greek writer.³⁴ For example, if a comet was eleven houses away from the sun, a king would die. Since such precise predictions bore the full weight of Ptolemy's authority, they were to be cited by many, including Reformed authors in the Dutch Republic, until late in the seventeenth century.

Comets in the Christian tradition

Unlike the Greeks and Romans, the early Christians spent little time speculating on the physical nature of comets. Their focus was explicitly on the divine significance of these and other heavenly signs. The Christian ideas about prodigia show many similarities with those of the classical authors, but give them a deeper, monotheistic content. Many passages in the Old Testament recorded the giving of a sign by

³² Ptolemy, Tetrabiblos II, 9.90.

³³ Tester, History of Western Astrology, 57-97; Idem, Ancient Astrology, 107-109; North, 'Comets'.

³⁴ Claudii Ptolemaei Opera III. 2.

God to humankind by means of a remarkable natural phenomenon. After the Flood, God addressed Noah and his sons with the following words:

I do set my bow in the cloud, and it shall be for a token of a covenant between me and the earth. And it shall come to pass, when I bring a cloud over the earth, that the bow shall be seen in the cloud. And I will remember my covenant.³⁵

According to the evangelists, both the birth and the death of Christ were accompanied by heavenly signs. Secular sources also noted that a striking number of *portenta* could be seen in the firmament during the persecution of the first Christians and the destruction of Jerusalem in 70 AD. A passage in *De bello Iudaico* by Flavius Josephus (ca. 37–ca.100), which described how a star, 'resembling a sword' had appeared above the city and a comet had stood in the sky for a year, was very often cited in connection with the destruction.³⁶

Later speculations on comets, however, were mainly based on the books of the prophets and the evangelists, such as 'And I will shew wonders in the heavens and in the earth, blood, and fire, and pillars of smoke' (*Joel* 3:30) or Jesus' prediction of the destruction of Jerusalem and the second coming of the Son of Man in *Matthew*:

Immediately after the tribulation of those days shall the sun be darkened, and the moon shall not give her light, and the stars shall fall from heaven, and the powers of the heavens shall be shaken.³⁷

The corresponding passage in *Luke* is even more emphatic:

Then said he unto them, Nation shall rise against nation, and kingdom against kingdom. And great earthquakes shall be in divers places, and famines, and pestilences; and fearful sights and great signs shall there be from heaven...And there shall be signs in the sun, and in the moon, and in the stars...Men's hearts failing them for fear, and for looking after those things which are coming on the earth: for the powers of heaven shall be shaken.³⁸

It is important to note that the Bible nowhere explicitly refers to comets, but only in general terms to 'wonders in the heavens', although

³⁵ Genesis 9:12-15.

³⁶ Josephus, De bello Iudaico VI, 5, 3.289.

³⁷ Matthew 24:29.

³⁸ Luke 21:10-11; 25-26.

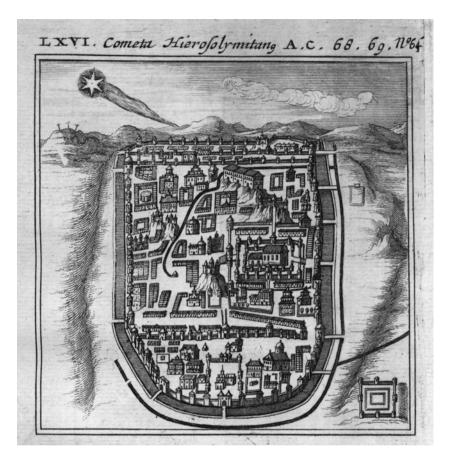


Fig. 16. Until far into the seventeenth century, the story of the comet seen during the destruction of Jerusalem—as recorded in Flavius Josephus' De bello Iudaico—made a great impression. This print is taken form Lubieniecki's Theatrum cometicum (1667) (KB).

scholars assumed that the reference was to comets until late in the seventeenth century. In his commentary on Joel 2:31 ('The sun shall be turned into darkness, and the moon into blood, before the great and terrible day of the Lord come'), for example, Hugo Grotius noted that the verse must refer to comets.³⁹ A universal religious significance was conferred on these signs on the basis of the passages cited. From an

³⁹ Grotius, Opera omnia theologica I, 507: 'Dabo prodigia in coelo... Solent magnas rerum conversiones praecedere cometae, gladii ardentes, alique signa ejusmodi'.

eschatological perspective, these *portenta in coelo* could be regarded as heralds of the Last Judgement and the Second Coming, and were more generally regarded as expressions of God's ire. For centuries, appearances in their own day were connected with famines, epidemics and wars by theologians and chroniclers.⁴⁰

The fear of comets and other *prodigia* received a new impulse as a result of the Reformation. Against the background of the turbulent religious conflicts and the strong millenarianism of the period, the sudden striking rise in frequency of these celestial signs was observed with extra attention. For instance, the comet that appeared in 1531 aroused the fascination, if not the rapture, of Melanchthon. According to the *Praeceptor Germaniae*, the signs that the Lord showed in the sky should be studied with the greatest possible care. They should be interpreted on the basis of classical authors as well as the Bible. Melanchthon's almost sacred reverence for antiquity was reflected in his embracing of Ptolemy's astrological writings. In correspondence with colleagues, he speculated on the deeper significance of the comet, as well as publishing a Latin translation with commentary of the Ptolemaic *Tetrabiblos* and *Centiloquium*.

This brings us to an extremely important point: the relation between astrology and Christianity.⁴⁴ First of all, it should be emphasised that there was hardly any hard and fast distinction between astrology and astronomy until late in the early modern era. Practically every scholar accepted that the celestial bodies were connected in one way or another with the sublunary world.⁴⁵

Since the Middle Ages, it had been customary to distinguish between 'natural astrology' and 'judicial astrology'. Although the distinction was rather vague, the latter included the art of forecasting future events on the basis of the planetary and stellar bodies. From a Christian perspective this was anathema: only God could see into the future. Besides, the Bible contained several passages that were interpreted as condemnations of divination. The *locus classicus* was *Jeremiah* 10:2: 'Learn not the way of the heathen, and be not dismayed at the signs of heaven;

⁴⁰ Genuth, Comets, 17-50.

⁴¹ Caroti, 'Comete, portenti, causalità naturale'; Kusukawa, Melanchthon, 124-173.

⁴² Warburg, 'Heidnisch-antike Weissagung'; Idem, Renewal of Pagan Antiquity, 597-697.

⁴³ (Ptolemy), De praedictionibus astronomicis. Philippo Melanthone interprete.

⁴⁴ Tester, History, 98-244; Barton, Ancient astrology, 64-83; Curry ed., Astrology, Science and Society.

⁴⁵ North, 'Celestial influence'.

for the heathen are dismayed at them'. That divinatio was a heathen practice can be clearly seen from *Deuteronomy* 18:10–12:

There shall not be found among you any one...that useth divination, or an observer of times, or an enchanter, or a witch...For all that do these things are an abomination unto the Lord.

The Christian emperors of the Roman Empire already regarded predictive astrology as heretical. Church fathers such as Augustine and Ambrose condemned the practice because it presupposed an unacceptable determinism and—above all—denied God's almightiness. All the same, conceptions about the correspondence between the celestial bodies and earthly events were so deeply rooted in Christian scientific culture that not only natural but also judicial astrology had a firm basis. Some authors hardly saw any contradiction between astral influences and divine providence. For instance, Melanchthon's fascination with astrology was shared by his friend, the famous humanist Joachim Camerarius I (1500–1574) and his son-in-law Caspar Peucer (1525–1602), the author of the often cited De praecipuis divinationum generibus (On the main types of divination, 1553).46 It would be difficult to overestimate the status that was assigned to judicial astrology in general, and to the predictive interpretation of comets in particular, as a result.

Dissident voices could be heard in Geneva, where Calvin's Avertissement contre l'astrologie was published in 1549. In accordance with tradition, the reformer distinguished between natural and judicial astrology, which in his terminology became 'genuine' and 'bastard' astrology. The latter type of astrology was blasphemous. Nevertheless, like Melanchthon, Calvin stressed that mankind could get to know God's almightiness from the courses of the stars and planets.⁴⁷

Calvin's tractate does not appear to have made much of an impact. Most of the many treatises on comets that appeared in Northern Europe in the sixteenth century show an inextricable intertwining of astrological predictions, Christian exhortations, and eschatological expectations. In every case the tradition going back to the classics and the Bible dictated and structured the interpretations. This emerges most clearly from a striking literary genre that was very popular in the middle of the century, particularly in Protestant circles: the books

⁴⁶ Warburg, 'Heidnisch-antike Weissagung'; Thorndike, *History* V, 402; Kusukawa, Melanchthon, 134-136; Weichenhan, 'Astrologie und natürliche Mantik'.

⁴⁷ Calvin, Avertissement contre l'astrologie, 27.



Fig. 17. In his posthumous *Monstrorum historia* (1647), Ulisse Aldrovandi presented a long chapter on the 'monsters of heaven', including comets in the shape of flaming swords (KB).

of prodigies.⁴⁸ In these weighty reference works, humanist compilers brought together chronological surveys of all the prodigies with which

⁴⁸ Schenda, 'Deutschen Prodigiensammlungen'; Daston and Park, *Wonders and the Order of Nature*, 173–214. On prodigy-books see below, Chapter Six.

God had warned humankind since the Creation. Evocative illustrations completed the whole. The title page of what was by far the most widely cited work, the Prodigiorum ac ostentorum chronicon (1557) by the Basel physician Conradus Lycosthenes (Conrad Wollfhart, 1518-1561) clearly shows how comets and other singular natural phenomena were interpreted identically.

Lycosthenes presented the world since the Creation as a chronological unity in which the physical order reflected the moral order. He wrote that he did not reject natural explanations and had a lot of respect for astrology, but that in the last resort nature was the messenger of God for both good and bad news.⁴⁹ Other books of this kind by Peucer, Melanchthon's pupil Jobus Fincelus, Marcus Frytschius and others were published. These convenient (and later uncritically copied) surveys made it abundantly clear that comets were unmistakably ominous signs: the battle of Salamis (480 BC), the Achaean War (148 BC), the violent and otherwise demises of the Julian emperors, the destruction of Jerusalem (70 AD), the fall of Rome (430 AD), the birth of Mohammed (730 AD), the terrible plague of 1348 and so on had all been announced by a comet, sometimes in combination with other prodigia. Contemporary prodigia required philological and exegetical interpretation. Exactly how God had created them was irrelevant.⁵⁰

Until late in the seventeenth century, humanists, natural philosophers, theologians and poets operated within the same mental framework as far as the use of comets for prediction was concerned. Given the persistence of topoi in that interpretative framework, it is hardly surprising that the meaning that was conferred on comets was relatively impervious to the changing views of the natural philosophical aspects of the matter. The Aristotelian theory of comets was by no means the only one in the sixteenth century, but it was certainly the dominant one.⁵¹ Problems were raised for Aristotelian physics by the astronomical observations of Tycho Brahe (1546-1601) in 1572 and 1577. It was the spectacular comet of 1577 in particular that caused such a stir throughout Europe. 52 From his observatory, Brahe conducted measurements of parallax and noted that there could be no

⁴⁹ Lycosthenes, Chronicon, 'Epistola Nuncupatoria'.

⁵⁰ Paré, Des monsters et prodiges, 142-147. See also Aldrovandi, Monstrorum historia, 716-743.

⁵¹ Jervis, Cometary Theory; Kokott, Kometen der Jahre 1531 bis 1539.

⁵² Hellman, Comet of 1577.

doubt about it: this was a *celestial* body that was in motion far above the moon.⁵³ The Saturnian appearance and the martial tail of the 1577 comet were ominous. Given the direction of the tail, there would be unrest all over Europe, especially in the Netherlands. The region would be hit by 'major bloodshed with much greater misfortune and damage'.⁵⁴

The 1577 comet provoked similar reactions in learned circles throughout Europe. Carolus Clusius, who would later become prefect of the *hortus botanicus* in Leiden, observed the comet from Vienna. He reported his observations in a letter to the German physician Joachim Camerarius II (1534–1598). 'God forbid that he does not warn us with such signs in vain', he remarked.⁵⁵

2. Dutch views on comets down to around 1660

The 1577 comet

Comets, eclipses of the sun and typically local *prodigia* such as beached whales also provoked emotional reactions in the Netherlands around 1577. The Dutch Revolt and all the horrors that accompanied it formed the décor against which these signs took on even sharper profiles. ⁵⁶ The context in which these *monstra* were regarded can be illustrated by a pamphlet describing the beaching of a whale in 1598: 'Read the Holy Scripture, read the old chronicles'. ⁵⁷ The authority of the corpus of texts, commentaries and explanations was enormous. For instance, the preacher Johannes Becius (1558–1626) referred to *Joel* 2:30 for the daily signs of God's wrath. The Lord darkens the sun, turns the moon to blood, and among the stars he causes the appearance of 'terrible comets like flaming fires, which show their prodigious effects in the destruction of kingdoms, nations and cities'. ⁵⁸

Many scholars, whether trained as theologians, philologists or physicians, regarded comets from the same perspective. This comet pres-

⁵³ Hellman, 'Role of Measurement'; Barker and Goldstein, 'Role of Comets'; Thoren, *Lord of Uraniborg*, 123–132, 136–138.

⁵⁴ Christianson, 'Brahe's German Treatise'; Genuth, Comets, 56–57.

⁵⁵ Hunger, l'Ecluse II, 352.

⁵⁶ Van Deursen, *Plain Lives*, 244–253; Egmond and Mason, 'Skeletons on Show'; Van Nouhuys, *Two-faced Janus*, 426–465.

⁵⁷ Walvisch van Berckhey.

⁵⁸ Becius, Het ghesette exemplaer der Godlosen, xii.

ages bloodshed, warned the Utrecht antiquarian Arnoldus Buchelius (1565–1641), with a reference to Manilius' Astronomica.⁵⁹ Among the documents left by Jan van Hout (1542-1609), the first secretary of Leiden University, are several Latin poems with lively speculations on the effects of this comet. 60 Lipsius, who was appointed in Leiden in the following year, based his conclusion that disaster was imminent on Greek sources. 61 In short, classically trained scholars were unanimous. If we were to use the term 'superstition' in this context, then it is a learned rather than a popular superstition.

The excitement provoked by the comet of 1577 is reflected not only in documents of the humanists but also in pamphlets written in the vernacular.⁶² We know of one pamphlet on the subject in the Northern Netherlands: De Historie, Natuere ende Beduidenisse der erschrickelicke Comeet (The history, nature and meaning of the terrible comet) by Johannes Heurnius (1543-1601). Heurnius was physician in Utrecht at the time. Four years later he was appointed professor of medicine in the recently founded Leiden University, a capacity in which he was to utter a negative pronouncement on the use of the ordeal by water in witchcraft trials.⁶³ This was a man of sound judgement. According to Heurnius, people pay hardly any attention to the course of nature, but a 'terrible comet' makes them aware of God's almightiness. People should beware of 'blindly ignoring this divine work with their eyes open'.64 After this admonition, Heurnius offered a physical explanation. More on the ground of speculation than on the basis of actual observation, he placed the comet in the superlunary sphere. He came to the conclusion that it consisted of 'the fifth element, known as the astral element'.65 The fact that God showed this 'monster of fate', this 'sign' to the world doubtless had prophetic significance:

⁵⁹ UBU Ms 798 I fol. 114/v. I owe this reference to Judith Pollmann. On Buchelius see: Pollmann, Religious Choice.

⁶⁰ GAL, Gildearchieven inv.nrs 1485, 1487. I owe this reference to Johan Koppennol 61 Iusti Lipsi Epistolae I, 75. On the correct dating of this letter see: Van Nouhuys, Two-faced Janus, 420.

⁶² Cf. Hellman, Comet of 1577.

⁶³ Molhuysen, Bronnen I, 74, 289-291.

⁶⁴ Heurnius, Historie, B1/r.

⁶⁵ Ibid., B1/v.

It is not that I say that comets or similar signs produce or make future changes, by no means, but they are natural signs that nature, at God's command, sends to us as the cause of change.⁶⁶

The whole creation, in Heurnius' view, was a complex system of references. A comet is a sign, just as fever is a symptom of illness, the flowering of a fig tree is a sign that summer is on its way, or external signs on the earth are an indication to the miner of where he should dig. People should know 'that the almighty God wishes to be seen in his wondrous works, and reveals himself to us in them so that we can touch him with the hands of our intellect'.⁶⁷

Heurnius proved to be an ardent advocate of astrological interpretation, and not only in this popular pamphlet; in his learned medical work he also appealed to both natural and judicial astrology. 68 He drew a sharp distinction between those who ignored the signs in the sky, and those who embraced the noble art of astrology. Those who pay heed to God's Creation can interpret the signs. Those who know the Bible and penetrate the writings of the ancient philosophers can also interpret the appearance of comets correctly.⁶⁹ Heurnius went on to base his prognostication on the Centiloquium of Ptolemy. According to the Utrecht physician, it was significant that the comet was generated by Mars and had appeared in the sign of Libra, the scales, while Saturn was firmly established in the eighth and ninth houses.⁷⁰ This does not seem to have been very accurate. Brahe, who knew Heurnius' pamphlet, felt the need to say something about it: if astrologers wanted to make predictions in this manner, they should ensure that they had correct data at their disposal.71

Heurnius nevertheless had no qualms about making his predictions. What exactly the future had in store was known by God alone, but had Christ not foretold that the Second Coming of the Son of Man would be announced by signs in the heavens? There would be a time of troubles and alarming portents before the Day of the Lord came. In the meantime the Netherlands could expect the following plagues: 'War, revolt, imprisonment, destruction, the wrath of princes, result-

⁶⁶ Ibid., A4/r.

⁵⁷ Ibid.

⁶⁸ Heurnius, Opera omnia, 78.

⁶⁹ Heurnius, Historie, B1/v.

⁷⁰ Ibid.

⁷¹ Brahe, Opera Omnia IV, 364-365.

ing in sudden attacks and terrible mortality, sorrow, injustice, arson, murder and shipwreck caused by storms'.72

The 1618 comet

Roughly forty years later, on 19 November 1618, another remarkable comet appeared. The religious and political situation in Central Europe had escalated to what is known as the Thirty Years' War. The religious disputes that followed the peace talks between the Republic and Spain that opened in 1607—the Bestandstwisten—were raging in the Dutch Republic. The comet appeared a few days before the opening of the Synod of Dordrecht, where it was the topic of conversation.⁷³ Publications containing speculations on the comet were issued all over Europe, with no less than seven in the Dutch Republic alone.

One of the best-known of these was written by the Groningen professor of medicine and mathematics Nicolaus Mulerius. He published a pamphlet in the vernacular, Hemelsche Trompet Morgenwecker ofte Comeet met een langebaert (Heavenly trumpet morning star or comet with a long beard).74 Mulerius was extremely well educated. He had already made a reputation with his authoritative edition of the Copernican De revolutionibus, a work that he held in high esteem in spite of the fact that he rejected its main thesis on biblical grounds.⁷⁵ He had also been issuing an extremely popular almanac for years, in which he calculated such phenomena as the position of the sun and moon and the latest date for blood-letting. Like the kindred spirit Philips Lansbergen, Mulerius was convinced that the firmament mirrored God's almightiness.⁷⁶ All celestial phenomena, both the course of the stars and planets and comets and eclipses, had a higher, divine significance. The Counter-Remonstrant was actually a convinced adherent to astrology in the widest sense of the word. He calculated horoscopes based on the time of birth, owned many standard works on the subject, and toyed with the idea of making a new translation from Greek into Latin of Ptolemy's Tetrabiblos because he was dissatisfied with Melanchthon's 1553 edition. Mulerius did not consider judicial

⁷² Heurnius, *Historie*, B2/r.

⁷³ Korte historie van de Synode, 30-31. On the Synod of Dordrecht: Israel, Dutch Republic, 460-464.

⁷⁴ Mulerius, Hemelsche Trompet.

⁷⁵ Jorink, 'Mulerius'; Vermij, Calvinist Copernicans, 45–52.

⁷⁶ Mulerius, Cort onderwijs, A2/v.

astrology to be at odds with divine providence, since God himself often used celestial signs as messengers. This was not the first such godsent warning that Mulerius had observed. He saw both the 1604 nova and the virtually invisible small comet of 1607 as signs that God 'intends to punish and chastise us'.⁷⁷

In his pamphlet on the comet of 1618, the professor referred to Aristotle to back up his statement that God and nature do not produce anything in vain: 'There is a reason for everything'.78 All the same, his physical speculations are subordinated to etymological discussions, evaluations of what has been written on comets over the centuries, and reflections on the significance of the recently observed 'heavenly trumpet'. His views on its meaning were more or les the same as those of Heurnius (who had supervised the thesis with which he gained his title in 1589). He cited Melanchthon, 'a learned and pious theologian', with approval on the need to turn to Ptolemy because other astrologers talked nonsense. 79 In spite of all his references to the Greek, however, Mulerius' predictions were extremely vague. Appealing to the Bible, he wrote that this sign was a warning from God about 'our sins, such as drinking, revelling, showing off and talking in an affected manner'.80 Unless the people repented, God would 'send his punishment over countries and peoples' in the form of war, famine and plague. History showed that these were the instruments with which God chastised humanity. Like his fellow authors, the professor concluded with a virtually exhaustive summary of every disaster that had followed the appearance of a comet in history. He probably took this from Lycosthenes' Prodigiorum ac ostentorum chronicon, of which he owned a copy.81

The Groningen professor observed the comet with the recently invented telescope, the first person known to have done so in the Netherlands.⁸² He had already seen celestial bodies 'unknown to the human race' in 1613, probably the phases of Venus and a moon encircling Jupiter.⁸³ Mulerius was no dogmatic Aristotelian; if the philosopher had still been alive, he cheerfully wrote,

⁷⁷ Huisman, 'Boeken en brieven'; Mulerius, Almanach voor 't Jaer MDCVIII.

⁷⁸ Mulerius, Hemelsche Trompet, Bvi.

⁷⁹ Ibid., Cii.

⁸⁰ Ibid., Ci.

⁸¹ Catalogus librorum...Nicolai Mulerii, nr. 516.

⁸² Mulerius, Hemelsche Trompet, Ai.

⁸³ Waterbolk, 'Van scherp zien', 200.

He would have been pleased to change his understanding of the entire matter of comets...As Seneca says: Ego non existimo Cometam subitaneum ignem, sed inter aeterna opera Naturae: I cannot believe that a comet is a newly kindled fire, but rather that it is one of the eternal works of God.84

Seneca's notion that comets too were superlunary phenomena strengthened Mulerius' conviction that biblical passages on celestial signs and the art of astrology were applicable here as well.

We find the same attitude in Mulerius' better-known colleague Willebrord Snellius, professor of mathematics and astronomy in Leiden.85 Snellius was a pupil of his father Rudolph and of the great Scaliger. Like Mulerius, he was strongly influenced by the idea of the sapientia veterum and by contemporary ideas along the lines of Stevin. Like his Groningen colleague, Snellius stressed the importance of observations. In his treatise Descriptio cometae, he provided accurate tables showing the course of this 'comet of awesome aspect' (cometa specie horrenda) through the firmament.86 Snellius too recorded a superlunary position. Unlike the works of many of his contemporaries, however, Snellius devoted the largest part of his tract to the physical nature of the celestial phenomenon. With a great display of erudition, he refuted the classical and contemporary theories about the 'long-haired stars' in hermetic Latin. Referring to Posidonius and Anaxagoras, he eventually came to the conclusion that comets were burning exhalations of the sun.87

In spite of the fact that comets could be explained in physical terms, he still regarded them as signs: 'Solids are not created by God in the immense ether to move about among the stars without purpose or effect'.88 He also rejected the notion that comets brought about change on earth—they were signa. When it came to their interpretation it is characteristic of Snellius' intellectual orientation that he first turned to the Babylonians, Egyptians and Chaldeans. In his view, the first nations on earth had an almost perfect knowledge of the mysteries of nature. His fascination with the prisca theologia is perfectly demonstrated in his admiration for Berosus, the Babylonian priest who had disseminated

⁸⁴ Mulerius, Hemelsche Trompet, Bv.

⁸⁵ Vermij, Calvinist Copernicans, 22-23; 43-45; De Wreede, Snellius, 159-173.

⁸⁶ Snellius, Descriptio cometae, 4-20.

⁸⁷ Ibid., 40-52.

⁸⁸ *Ibid.*, 57.

the astronomical knowledge of his ancestors in Greece around 280 BC.⁸⁹ Snellius was a keen advocate of judicial astrology and cited such occult sources as the *Aphorismi astrologici Lodovici de Regiis*, a collection of 201 predictions along the lines of the *Centiloquium*. The Leiden professor rejected the Ptolemaic view of comets as atmospheric phenomena. Since comets originated in the celestial bodies, they had the same effects. The nature, course and appearance of the 1618 comet were very like those of the comet described in the *De judiciis astrorum* by Ali ibn Ridwan (998–1061), an Arab commentator on Ptolemy's *Tetrabiblos.*⁹⁰ This scholar, Snellius wrote, had observed a comet that first appeared in the fifteenth degree of Scorpion, directly opposite the sun and moon. It had been followed by wars in Mauritania, defeats, destructions, drought, hard times and eventually the plague and massive deaths. Snellius therefore concluded in his final chapter:

As far as our comet is concerned, I am convinced by the similarity of its place of origin, the proximity of its course, and its general appearance [with the comet of Ali ibn Ridwan], all the more so because, powerful from the start, it waxed considerably. In the end, during the last few days, when it had been hardly visible for some time because of its diminished clarity, it still radiated a bright light from its hairs as if to take leave. What weighs most heavily for me is the fact that Saturn welcomed its first appearance with its hostile rays and contaminated it with its evil qualities. I therefore fear that this comet will have very strong effects of a Saturnian kind.⁹¹

Although Snellius' final prediction was rather vague, there was no doubt about his attitude towards judicial astrology.

The relation between the Christian tradition and predictive astrology was contested, to say the least. Study of Dutch almanacs shows that the use of astrological methods was more popular in the Dutch Republic, also among educated people, than is usually assumed. As we have seen, Heurnius, Mulerius and Snellius propagated this type of interpretation without any qualms. Mulerius was an active Counter-Remonstrant who felt called upon to warn Leiden University against the appeals of the theologian Conradus Vorstius (1569–1622), who

⁸⁹ Ibid., 45.

⁹⁰ On Ali ibn Ridwan see: Grant, Source Book, 639; 817; North, Horoscopes and History, 84-91.

⁹¹ Snellius, Descriptio cometae, 67.

⁹² Salman, Populair drukwerk, 39-133.

was suspected of Socinianism.⁹³ Little is known about Snellius' religious convictions, but at any rate he survived the purge of Leiden University after de *Bestandstwisten* in 1618. There is no indication that the professors had even superficially leafed through Calvin's *Avertissement contre l'astrologie*. They were much closer to Melanchthon, who did not see any contradiction between divine providence and celestial influences.

This point of view was also shared by less scholarly Dutch pamphleteers. The Leeuwarden physician Johannes Velsius, the obscure writer of almanacs Saxus Fontanus, and the equally murky figure of Balduinius Nicolae all referred to Ptolemy in this connection. ⁹⁴ Unlike Snellius and Mulerius, however, they did feel the need to present astrology with a measure of reticence. ⁹⁵ It could serve a useful purpose provided it was deployed in a 'Christian' way.

The same message was repeated at greater length in an anonymous booklet published in 1619, Aenmerckinghe op de tegenwoordige steertsterre (Remarks on the present tailed star). It is generally attributed to the poet and statesman Jacob Cats. The work, comprising a poem and moralising essays, bore the significant subtitle Met aenwijsinghe vande rechte wetenschap om alle teykenen des Hemels, ende vreemde Gesternten wel ende loffelijck uyt te leggen (With use of correct science to properly and excellently explain all celestial signs and strange constellations). Apparently not every Calvinist was happy with the embracing of judicial astrology, for the treatise is explicitly aimed against this way of interpreting comets. The author distinguishes three types of people. The first believe that the celestial signs determine human activity and that people can read them. The second pay no heed at all to what can be seen in the firmament. The third follow the only middle course by honouring God and fearing his works.

The supporters of the first method were thus those who believed in telling the future from the stars. This type of interpretation should be resolutely rejected by all God-fearing people 'as in conflict with the eternal providence of God...and also as being clearly and soundly

⁹³ Molhuysen, Bronnen II, 32*-33*.

⁹⁴ Velsius, Prognosticatie; Fontanus, Practica Ofte Prognosticatie; Nicolai, Verklaringhe Om yegelijcken te adverteeren.

⁹⁵ Nicolai, Verklaringhe, vi.

⁹⁶ On Cats' authorship see: Cats, Aenmerckinghe. Ed. Johannes, 9–35.



Fig. 18. Frontispiece of Jacob Cats' *Aenmerckinghe*. The two men to the right are discussing whether the comet has any significance or not; the figure to the left is about to explain a true Christian interpretation of this divine sign (KB).

forbidden in God's word, Jeremiah 10:2. Deuteronomy 18:9'.97 The conduct of the second category was entirely at odds with the spirit of the Bible, particularly the text of *Psalm* 19:1: 'The heavens declare the glory of God; and the firmament sheweth his handywork'. By never glancing upwards, they neglected the majesty of the Creator where it was most patently visible. The fact that the book of Jeremiah taught that people should not fear signs did not imply that they should ignore them.

The only right way to consider a comet and other celestial phenomena was 'in accordance with the content of the Holy Scripture'.98 We can here detect the influence of Reformist doctrine on the Book of Nature. After all, countless passages in the Bible narrated how God addressed humankind by means of regular and extraordinary signs in the heavens. The author claimed that a distinction should be made between ordinary and extraordinary motions in the firmament. The former were not only responsible for the seasons and the tides, but could be put to good use in navigation, for example. Extraordinary motions, 'unusual appearance of stars, or any change in the course of the heavenly lights', were no doubt signs from God that he would perform 'something exceptional and unusual' on earth 'as an example'.99 Cats cited a number of biblical miracles, such as *Joshua* 10:12-13 describing the battle during which the sun and moon stood still, or the solar eclipse when Christ died on the cross. By far the most unusual celestial phenomena, namely comets, were signs sent by God and were a summons to proper moral behaviour. It made little difference whether they had a natural, supernatural or extra-natural cause.

The tradition had it that comets announced God's punishments. Cats supported this with a number of fragments by such writers as Manilius, Seneca, Claudian and Lucan. The comet of 1577 had been immediately followed by protracted and bloody wars. 100 For more examples Cats referred for brevity's sake to the Catalogus prodigiorum ac ostentorum by Frytschius. 101

The traditional interpretation of comets was given a Christian twist by Cats. This is the first time we find explicit attention paid to the relation between the Greco-Roman and the Christian legacies. In the spirit

⁹⁷ Cats, Aenmerckinghe, 75.

⁹⁸ Ibid., 79.

⁹⁹ Ibid.

¹⁰⁰ Ibid., 89.

¹⁰¹ Ibid., 83-89.

of Augustine (and of Calvin, though he is not cited), astrology is characterised as heathen because, as *Deuteronomy* 18:10–12 stated, such things are 'an abomination unto the Lord'. This is a very clear example of how the Reformed doctrine of the Book of Nature functioned in practice: the Creation was first interpreted on the basis of the Holy Scripture. In this respect, comets were not an isolated phenomenon.

A particularly interesting parallel, which Cats himself provides, is the rainbow. It was already generally known in antiquity that it was the result of the reflection of the sun's rays on raindrops. ¹⁰² Cats too claimed that the rainbow undoubtedly had a natural cause, not an extra-natural or supernatural one. ¹⁰³ 'All the same, it is still a sign of the covenant between God and all living creatures, *Genesis* 9:12'. This argument was to persist throughout the century.

That a (correct) physical explanation could be accompanied by a message dictated by the Holy Scripture can also be seen from another example that shows a strong resemblance to the debate on comets: the eclipse. In this case too, astronomers had been aware of the physical cause for millennia, and were often even able to calculate with accuracy when an eclipse of the sun or moon or a conjunction of planets would take place. 104 Cats mentioned the fact, and Mulerius had already provided an interesting consideration of the phenomenon in his widely read almanacs.¹⁰⁵ The mathematician claimed that the darkness that fell between the six and the ninth hour on 3 April 33 during Christ's crucifixion was no doubt the consequence of a miraculous solar eclipse that could not be calculated astronomically. However, the evangelists had failed to note that there was an eclipse of the moon on that same evening, as Mulerius had calculated!¹⁰⁶ Two eclipses on one day, one natural and the other supernatural, had never been seen before and must therefore be a miracle. Mulerius stated with relish.

Philips Lansbergen, another well-known astronomer, also sanctioned the divine significance of such celestial phenomena through the Bible. He was well aware of the classical writings on astrology and even cast nativity horoscopes himself, but was very reticent in them. 107 He wrote

¹⁰² Lindberg, Beginnings of Western Science, 252–253.

¹⁰³ Cats, Aenmerckinghe, 91.

¹⁰⁴ See for example: Labrousse, L'entreé du Saturne au Lion.

¹⁰⁵ Cats, Aenmerckinghe, 81.

¹⁰⁶ Mulerius, Practica ofte prognostica.

¹⁰⁷ Vermij, *Calvinist Copernicans*, 72–99; De Waard, 'Nog twee brieven van Philips Lansbergen'.

a poem on the nova of 1604 in which he interpreted this new star as a herald of divine punishments and the Last Judgement. 108 Voetius mentions that he had read a (no longer extant) poem by Lansbergen on the comet of 1607, which probably had a similar message. 109 In his defence of the heliocentric system, Lansbergen wrote that, although eclipses had natural causes 'which are well enough known', they did not cease to be 'miraculous in themselves'. 110 The Bible and history, he claimed, showed that these were also the precursors of epidemics and other disasters. The commonly heard view that the rise of natural scientific explanatory models sounded the death-knell of superstitious opinions on ominous meanings is hard to reconcile with this evidence. What counted in the discussion at the time was the letter of the Bible.

The Further Reformation versus superstitious practices

The attack by Cats on superstitious interpretations has to be seen in the context of Pietism associated with the province of Zeeland and the related Further Reformation.¹¹¹ These tendencies, which were influenced by English Puritanism, set out to take God's word as the basis for both individual religious experience and the general organisation of society. One of the consequences of this position was that preachers and elders continuously agitated against what they called superstitious practices. The main enemy was of course diabolical Papism with its whole baggage of saints performing miracles, but the Bible was also used to wage fierce polemics against dancing, organ playing in church, the wearing of wigs, and observance of the Sabbath. In this context the offensive against idolatry and fortune-telling is important. 112 For instance, a prominent Pietist translated the treatise that the famous Puritan William Perkins had written against astrology, Four great lyers (1586), into Dutch in 1613 under the title Onderrichtinghe van het misbruycken der prognosticatien. 113 Perkins rejected an astrological

¹⁰⁸ Hallyn, 'Un poème inédit de Philippe van Lansbergen'.

¹⁰⁹ Voetius, Exercitatio, 58.

¹¹⁰ Lansbergen, Bedenckinghen, 73.

¹¹¹ Israel, Dutch Republic, 474-477; Frijhoff, Fulfilling God's Mission.

¹¹² Stronks, 'Onderwijs van de gereformeerde kerk'; De Waardt, Toverij en samen-

Perkins, Onderrichtinghe van het misbruycken der prognosticatien. See: Schoneveld, Intertraffic of the Mind, 124-125.

interpretation of comets, but emphasised that they were signs of God's wrath.¹¹⁴

The most influential proponent of this viewpoint was without a doubt Gisbertus Voetius. In the rectoral oration of 1636 in which this professor of theology presented his religious credentials, the key to understanding every sign in the Book of Nature was exclusively the Bible. The Lord 'invites us to the same knowledge while laying the correct foundations and permanent principles of it in the Holy Scripture. There you can read about the heaven and its lights'. 115 Referring to Psalm 19:1 and such theologians as Augustine, Melanchthon and Lansbergen, Voetius claimed that astronomical studies in particular promoted piety. The heavens declare the glory of God, but this does not mean abandoning ourselves to fortune-telling like the heathen. With a reference to Jeremiah 10:2, he sharply condemned the superstitious predictions of astrologers. 116 Besides this programmatic oration, Voetius waged a relentless war on everything that he regarded as being at odds with God's word throughout his long life (he died in 1676), including Cartesianism and, in its wake, Copernicanism, as well as spells, magic, idolatry and divination.¹¹⁷

Professor Voetius organised a number of disputations on the issue in 1640, on the eve of the Cartesian controversy: *De superstitione; De idolatria indirecta et participata*, and *De signis, de naturae miraculis, ostentis et prodigiis.*¹¹⁸ Voetius goes through a number of familiar points in the disputations: he rejects Papism and heathen idolatry. In principle miracles are still possible, although probably very sporadic since the time of the apostles. Much more important than the question of whether a particular phenomenon is natural, extra-natural or supernatural, is the fact that God still performs astonishing works (*admiranda quaedam*), which of course include *prodigia* and *signa*.¹¹⁹ But what is a sign, and how is it to be interpreted? It goes without saying that people must pay heed to the signs that God gives them through nature. On the other hand, this could only too readily assume the character of heathen divination. A recurrent question is whether

¹¹⁴ Perkins, Onderrichtinghe, 15/r.

¹¹⁵ Voetius, Sermoen, 29.

¹¹⁶ Ibid., 30-32.

¹¹⁷ Vermij, Calvinist Copernicans, 241-330.

¹¹⁸ Voetius, Selectarum disputationum theologicarum partes V, II, 902–1140; III, 91–387.

¹¹⁹ Ibid. II, 1024.

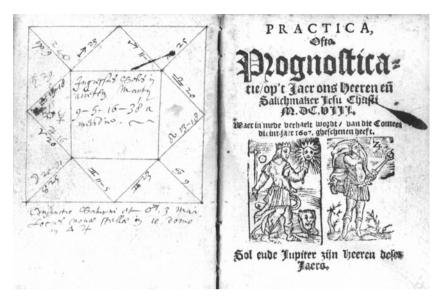


Fig. 19. The Groningen mathematician Nicolaus Mulerius not only speculated about the meaning of comets; he was also one of the few Dutch professors who casted horoscopes, as we can see on these notes in Mulerius' own copy of his Prognostica for 1608 (UBG).

monsters, dreams, volcanic eruptions, nosebleeds, the appearance of ghosts and eclipses are signa Dei or not. Referring to Deuteronomy 18:9-14, Voetius excludes such practices as 'teratoscopy, pyromancy, augury, auspices'. They are an anathema to God. Only the signs explicitly mentioned in the Bible that can be found 'in libro naturae' can be interpreted as signs of the Lord. 120

How is one to understand Jeremiah 10:2: 'Be not dismayed at the signs of heaven'? Voetius argues that celestial signs should absolutely never be explained in accordance with the godless method of judicial astrology. 121 That would be heathen superstition. With regard to eclipses, he notes that they are signs of God's almightiness, but that their predictive value is as great as the rising and setting of the sun, or the waxing and waning of the moon.¹²² On the other hand, Voetius has no difficulty in assuming that comets are the great signs from heaven

¹²⁰ Ibid. III, 923.

¹²¹ Ibid. II, 922-923; 929-930; III, 256-259.

¹²² Ibid. II, 929.

mentioned in Luke 21. A comet is a 'signum, prodigium, ostentum, portentum' sent by God to humankind. 123 It creates fear and admiration of God and is a warning to humans. He firmly rejects an astrological interpretation of comets, as practised shortly before by orthodox scholars such as Mulerius, because he considers it to be in opposition to God's word. In this respect Voetius uses the same arguments as Cats and Perkins (from whose work he cites extensively). It is not permitted to make detailed predictions, but 'from the experience of all times and the verdict of all men, they do announce drastic changes'. 124 Such celestial signs could herald plague, war and famine. The legitimation for this lay in the Bible and a knowledge of history. Voetius refers explicitly in this connection to the works of Virgil, Melanchthon, Peucer, Cardano, Lemnius, Lycosthenes and others.

Voetius' desire to read the Book of Nature solely on the basis of the literal text of the Bible and to bypass the classical heathen legacy can also be seen in the case of a kindred spirit, the preacher-poet Jacob Revius (1586-1658). The theological work of this regent dean of the Statencollege, the university educational institute for clergymen in Leiden, attacked Descartes and defended geocentrism.¹²⁵ He also organised disputations against superstition. In a collection of such works, we find two discussions of judicial astrology amid theses on the veneration of relics and the cult of the Virgin Mary. 126 The practice was rejected on the basis of references to all the biblical passages. In a different context, Revius was later to remark that 'in these matters the Christian religion determines the rules of philosophy'. 127

We see the same pattern in the work that Revius wrote for a much larger public, his poetry. Voetius had already claimed that poetry and religion were inextricably intertwined, but poets should not slavishly follow the classics, as many humanistic poets were only too keen to do. 128 Revius shows how this principle was put into practice. The firmament was not a pretext to celebrate the signs of the zodiac and mythological figures, but a summons to piety. In contemplating the heavens, men should stand still in admiration without yielding to cor-

¹²³ Ibid. II, 912.

¹²⁴ Ibid. II, 929.

¹²⁵ Vermij, Calvinist Copernicans, 116-169; Goudriaan ed., Jacobus Revius.

¹²⁶ Disputatio De judiciis astrorum resp. R. Mulhovius; De judiciis astrorum, altera resp. G. Alutarius in: Revius, Analectorum theologicorum disputationes CCCXXXI.

Revius, *Statera philosophiae cartesianae*, 316. stronks, *Stichten of schitteren*, 276–278.

rupt practices. The learned poet thus mocked the astrological predictions that were to be found in the popular press. 129

Humanists and prodigia

The biblical ideal of piety of the Further Reformation was one influential stimulus to take a critical view of the pagan legacy of ideas on celestial signs. Humanism was another stimulus. Dutch Neo-Latinists had originally presented themselves as having specialist knowledge of prodigia. In the first half of the seventeenth century, however, a striking change took place, and this group of scholars now began to label wondrous signs as expressions of lower-class superstition. For instance, in 1598 Grotius had written a learned poem about the ominous beached whale of that year which conformed entirely to the poetic rules of the time.130 When he described the same event later in his Annales, he drew a sharp distinction between the educated, who wondered what the cause of the phenomenon was, and the common herd (vulgus), that regarded the beaching of the whale as an ominous sign. 131 We find a similar attitude in P.C. Hooft's Nederlandsche Historiën, (Dutch history) which stated that the comet of 1577 had only aroused fear and terror among the 'common people'.132

This is an important point. While humanists had initially identified with their classical heroes without any reservations, source criticism became a force to be reckoned with in the course of the seventeenth century. The increased philological expertise brought to light more and more anomalies, contradictions and alternative interpretations. How true the words of Cicero proved to be: Nihil tam absurde dici potest, quod non dicatur ab aliquo Philosophorum (There is no claim so foolish that there is not some philosopher who makes it). 133 Moreover, more generally, the pagan content of many writings was increasingly regarded as incompatible with Christian morality. 134 That does not mean to say that the humanists were not interested in celestial signs. The opposite is true. Such scholars as Huygens, Barlaeus and Gerardus Vossius were convinced that the Creation was a book of

¹²⁹ Salman, Populair drukwerk, 53.

¹³⁰ Grotius, Poemata, 399.

¹³¹ Grotius, Annales et historiae de rebus Belgicis, 307.

¹³² Hooft, Nederlandsche Historiën XII, 546.

¹³³ Cicero, De divinatione II, 119.

¹³⁴ Seznec, La survivance des dieux antiques; Van de Waal, Geschied-uitbeelding.

God's almightiness. In many passages they therefore stated that the Creator manifested himself in the firmament. For instance, in 1636 Caspar Barlaeus, professor of philosophy at the Athenaeum Illustre in Amsterdam and a friend of Huygens, delivered an oration De coeli admirandis (On the wonders of the sky), in which he went further into the edifying aspect of astronomy. The classics had voiced a wide diversity of opinions on the celestial bodies—as they had done on many other matters—and had discussed not only the position of the sun but also the nature of comets. 135 Barlaeus was as much in the dark about these signs as the ancients had been, although he considers them to belong to the eternal works of nature. History seemed to show that they heralded bloodshed and other disasters, but Barlaeus could not tell whether they also caused such events. 136 In the spirit of Seneca, he remarked that the future would probably bring more clarity. In contemplating such celestial signs, people should not get lost in divinatory techniques, but praise the works of the Lord.

Barlaeus' colleague Gerardus Vossius displayed the same reticence in his monumental study of the history of the worship of nature, De theologia gentili. This panoramic survey contains a discussion of the different ideas about comets in antiquity. 137 Vossius knew his sources thoroughly and, embedded in reflections on astronomy in general, noted how much the opinions of the ancients diverged on both the nature and the influence of comets. Many had believed that comets were precursors of disaster. Others had written that they sometimes heralded joyful events. Vossius does not take sides. Referring to the observations of Brahe and of 'my Leiden friend and colleague' Snellius, he considered that they were superlunary entities.¹³⁸ In any case they were miracles of God, but he refrained from making any explicit statement on a connection between the appearance of a comet and its consequences. Vossius cites a story about Louis the Pious (778-840) at length. When a comet appeared, Louis, referring to Jeremiah 10:2, was exhorted not to fear the signs in the sky as the heathen did. The king replied that he did not fear these signs, but the almighty God—a remark that was of course entirely in harmony with the Reformed orthodoxy

¹³⁵ Barlaeus, Oratio de coeli admirandis, 5.

¹³⁶ Ibid., 22-23.

¹³⁷ Vossius, De theologia gentili, 283–285.

¹³⁸ Ibid., 284-285.

of the mid-seventeenth century. Thus Vossius only raised the question of the biblical interpretation of comets in an indirect way.

De theologia gentili was in all respects a treasure-house of allusions. It is rather ironical, but given the nature of the work also understandable, that later both proponents and opponents of the view that comets were expressions of God's wrath appealed to the great Vossius. Unintentionally this coping-stone of the humanistic tradition had emphasised the subjectivity of the notion of superstition and drawn attention to the historical dimension of the fear of comets.

While Vossius' book was a double-edged sword, the work that his friend Claude Saumaise devoted to the refutation of astrology in 1648 was more of a bludgeon. This extremely talented philologist was the star in the firmament of Leiden University from 1632 to his death in 1653, and was accorded the same privileges that Scaliger had once enjoyed. 139 This treasurer of antiquity did not lecture, but among his pupils were Vossius' son Isaac. One of the eighty books that Saumaise published was De annis climactericis et antiqua astrologia diatribae (Diatribes on climacterics and ancient astrology). This learned attack on numerical mysticism and astrology also had an effect on revealed theology. With the assistance of Isaac Vossius, Saumaise had collated all of the extant Arabic, Greek and Roman writings on astrology. In more than a thousand pages, Saumaise argued that judicial astrology was built on sand. The various ancient authorities contradicted one another on essential points. Manuscripts proved to have been mistranslated from Greek via Arabic into Latin. The tradition to which supporters of astrology appealed was therefore corrupt. Moreover, this form of fortunetelling had already been condemned by various Greek scholars, and later by the church fathers and Christian emperors as well. The ancients had been wrong in regarding the stars as deities. Neither should the fact that rabbis and astrologers in the past had identified planets and signs of the zodiac with plants, metals and parts of the human body serve as an example for Christians; on the contrary. 140 Is it not curious, Saumaise rhetorically asked, that such heathen practices as haruspicy and augury are now condemned, but astrology is not?¹⁴¹ He concluded: 'It is impossible for a good Christian to be a good astrologer'. 142 The

¹³⁹ Leroy, Du reforme Claude Saumaise, 33-52; Blok, Vossius, 27-44 and passim.

¹⁴⁰ Saumaise, De annis climactericis, 'Synopsis operis'.

¹⁴¹ Ibid., 805.

¹⁴² Ibid., 804.

work of the philologist made a big impression in the scholarly world and appears to have sold very well indeed. High Immediately after its publication, Constantijn Huygens sent a note to Saumaise to compliment him on his rich arsenal of arguments 'against the follies of centuries and the foolish impression of idiots'. Huygens himself had already noted around 1630 that he had 'never really' had any time for 'applied astronomy or astrology', though the words suggest that he had succumbed at some time in his youth. However that may be, Huygens now stated unambiguously that Augustine had already come up with convincing arguments against 'the conceited and superstitious priests of this cult'. Adherents could thus expect to be the butts of Huygens' satire and contempt. Huygens was by no means prepared to exclude the possibility that unusual celestial phenomena could have a deeper meaning, as his reflections on the corona above Orange show.

There was thus a lively interest in celestial signs in general and comets in particular among the circles of leading humanists. They were excellently informed about classical and often recent literature too. As a result, they could not make unambiguous statements on comets. The consequence was a certain reticence regarding the opinion which had been unanimously voiced until then, namely that they were exclusively heralds of divine punishments, and a rejection of astrological interpretation in the spirit of Ptolemy and his predecessors, the Babylonians, Chaldeans and Egyptians. The ideas of the ancients were increasingly regarded as the product of their time, and not in every respect as examples to be followed. The study of the Book of Nature on the basis of the Bible and the corpus of classical texts made interpretation more difficult rather than easier.

Developments in natural philosophy: Descartes

For the natural philosophers too, who were mainly interested in the physical character of natural phenomena, the canon initially continued to form the basis for their reflections on comets. The tendency to observe and measure that Tycho Brahe had initiated led to major

¹⁴³ Thorndike, *History* VII, 103.

¹⁴⁴ BCH IV, 448. See also: OCCH I, 78.

¹⁴⁵ Huygens, Mijn jeugd, 115.

¹⁴⁶ GCH III, 25; VII, 147, 324.

¹⁴⁷ Cf. GCH VII, 82.

problems of interpretation. The Leiden professor Gilbertus Jaccheus (1578–1628) still had no qualms about defending the Aristotelian theory of fiery exhalations in 1620, while for Mulerius and Snellius this was no longer tenable. 148 The same pattern can be detected elsewhere in Europe. With or without reference to the classics, numerous exciting theories were announced in the middle of the seventeenth century: they were burning sublunary exhalations after all; conjunctions of planets; optical illusions; cosmic lenses; celestial rockets of some kind; celestial bodies that followed regular courses; spontaneously generated objects consisting of celestial matter; secretions of the planets; etc. 149 'A great many divergent opinions are expressed on comets' was how the Amsterdam professor of philosophy Senguerdius summed up the state of affairs in 1653.150

Senguerdius' lament is illustrative of the wrestling of several generations of professors with this problem. Such figures as the influential Leiden Neo-Aristotelian Franco Burgersdijk (1590-1635), the physician and philosopher Anthonius Deusing (1612-1666), and the colourful anti-Cartesian Martinus Schoock (1614-1669) agreed with him that astronomical observations caused problems to come to the surface with regard to the Peripatetic view of the cosmos in general and of comets in particular. 151 The scholars were by no means dogmatic, but they were well aware of the long tradition to which they belonged. This found expression, for example, in reflections on the Book of Nature, in which, as Burgersdijk put it, 'the public signs of the Godhead are inscribed'. 152 As far as comets were concerned, Aristotle was only the starting point in very general terms: there seem to be superlunary and sublunary comets. Perhaps they are eternal creations, perhaps not. Perhaps their appearance is connected with disaster on earth—either because they are signs, or because they are its cause—but this is probably not the case. In short, the situation was one of total confusion. The main point was that comets are among

¹⁴⁸ Jaccheus, Institutiones physicae, 177.

¹⁴⁹ Drake and O'Malley ed., *Controversy on the Comets of 1618*; Ruffner, 'The Curved and the Straight'; Ariew, 'Theory of Comets'.

¹⁵⁰ Senguerdius, Introductionis ad physicam libri sex, 320.

¹⁵¹ Burgersdijk, Collegium physicum, 106-116, 145-156; Deusing, Naturae theatrum universale, 218-246; Senguerdius, Introductionis ad physicam, 320-332; Schoock, Physica caelestis, 227-272.

¹⁵² Burgersdijk, Institutio metafysica, 188. See also: Deusing, Naturae theatrum universale.

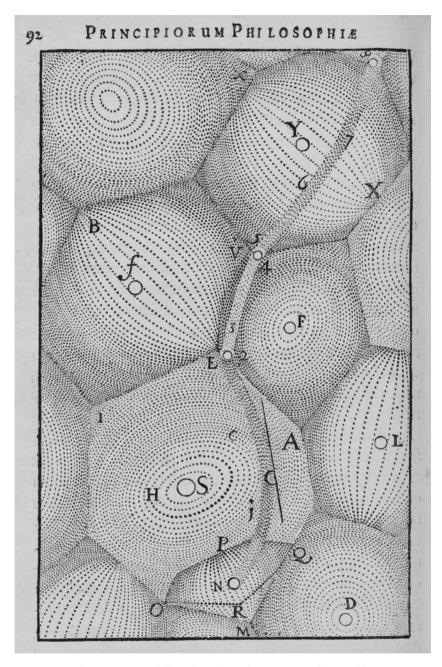


Fig. 20. In the *Principia philosophiae* (1644), Descartes depicted how comets, consisting of tiny particles, were pushed along the *vortices* that filled the universe (KB).

the miraculous works of nature, and that people should not engage in predictive astrology. The biblical interpretative framework was not for discussion at all, not even for a mathematician like the Amsterdam professor Alexander de Bie (c.1620-1690).¹⁵³ In 1653 he stated that the physical nature of comets was unfathomable. 154 He also noted that they were signs of God's wrath, just as the rainbow was a sign of his goodness (Genesis 9:13).155

While Dutch philosophers of nature shillied and shallied, a French extra muros colleague explained the nature of the universe with great precision. Descartes had already offered an explanation for 'the origin and course of planets and comets' in his Le monde of 1633, but that manuscript had not vet appeared in print. The curious had to wait until 1644, when the Principia philosophiae was published. In the meantime the philosopher had already raised the tip of the veil. In the essay Les météores that accompanied the Discours (1637), the sworn enemy of Aristotle refuted the theory that comets were exhalations of the earth. 157 In a neat reversal of Aristotle's argumentation, Descartes stated that, since they belonged to the heavens, he could not go into them in a treatise on meteorological phenomena. All that he was prepared to comment was that comets and other prodigious celestial phenomena were a permanent theme in the literary tradition. There was a rational explanation for comets, just as there was for everything in the Cartesian universe. The role of *lusus naturae* and preternatural phenomena was eliminated on philosophical grounds.

The *Principia* expounded the view that the cosmos was in principle uniform. Neither the earth nor the sun occupied a privileged position in it. All stars were suns, and each formed the centre of a whirling stream of particles of matter (vortices) that propelled the planets. Particles could be swept from one vortex to another and thus form a new planet, or be pushed further away towards the periphery and coagulate to form a comet. 158 The motion of comets was irregular. They often disappeared from view from the earth, but remained visible for a shorter

¹⁵³ Vermij, Calvinist Copernicans, 172, 182; Van Miert, Humanism in an Age of Science, 214-215, 259-263.

¹⁵⁴ De Bie, Disputationum astronomicarum secunda, de cauda cometarum, C1/r. See also: Idem, Disputationum astronomicarum tertia, de motu cometarum.

¹⁵⁵ De Bie, Disputationum astronomicarum secunda, de cauda cometarum, C1/v.

¹⁵⁶ AT XI, 56-63.

¹⁵⁷ AT VII, 323-334.

¹⁵⁸ AT VIII-1, 161-181.

or longer period from a particular angle as a result of the refraction of sunlight. 'The first thing one notices about them', Descartes wrote, 'is that one traverses one part of the sky, the other the other part, without following any rule known to us'. '159 Comets were not eternal creations, but in the last resort obeyed the same laws as the whole universe.

This explanation of the universe was evidently in theory incompatible with the scholastic Aristotelianism to which scholars like Voetius adhered. In the teleological view of nature based on Aristotle, there was a natural explanation for every individual case, for each separate entity. A singular cause could be pinpointed for the appearance of a comet, or for any other event that deviated from the natural order. Thus, irrespective of their nature, they had a special significance because it was a divine one. In the Cartesian vision, the seemingly

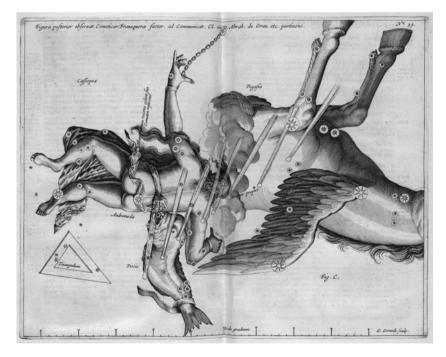


Fig. 21. The Franeker professor Abraham de Grau was an active comet hunter, who followed the course of the comet of 1664. This observation was included in Lubieniecki's *Theatrum cometicum* (1667) (KB).

¹⁵⁹ AT VIII-1, 178.

irregular appearances of the comets were due to general causes that operated in all places at all times. Phenomena such as comets were merely epiphenomena of the original causes, the laws of nature, which were otherwise imperceptible. 160

The different conceptions of causality were accompanied by a fundamental difference of opinion on the meaning of natural phenomena. In the traditional vision, in which the Book of Nature was read through the lens of the Bible, there was no need for natural causes to exclude supernatural meanings. Cats and De Bie believed that the rainbow 'is undoubtedly produced by natural causes', but that nevertheless it was a sign from God, and Lansbergen adopted the same standpoint with regard to eclipses. 161 Descartes stripped nature of its semiotic character: only the rules of geometry held sway. Biblical references were in principle irrelevant. The crux of the debate was thus in the end not the explanatory model followed, but the readiness of the researcher to relate the perceived phenomena to the text of the Holy Scripture.

The influence of Cartesianism in the Dutch Republic was enormous. While the Voetians rose unanimously to defend Aristotelianism, the Cartesians tried to operationalise his teachings and to incorporate them in their own theories. Cartesian physics was to have far-reaching consequences for the debate on Copernicanism and, in its wake, the debate on comets. There was more hesitation regarding the status of the Bible in relation to these astronomical problems. Descartes' renegade epigone Henricus Regius copied the relevant passages on comets from the Principia word for word in 1654.162 Another Cartesian, Johannes de Raey, defended the more general thesis that comets were objects that certainly followed the laws of nature. 163 An ominous meaning was called into doubt.164 Much more of an eclectic was the Franeker professor of mathematics Abraham de Grau (1632-1683), who took over the Cartesian theory on comets almost word for word, but left open the possibility that they might be signs of God's wrath.¹⁶⁵ The real clash

¹⁶⁰ Vermij, 'Wetten der natuur', 112-113.

¹⁶¹ Cats, Aenmerckinghe, 91; De Bie, Disputatio secunda, C1/r; Lansbergen, Bedenckinghen, 73.

Regius, Fundamenta physics, 62-64.

¹⁶³ Kopeczi, Disputatio philosophica de cometis prima...sub praesidio D. Johannis de Raei, xxvii.

¹⁶⁴ Kopeczi, Disputatio philosophica de cometis secunda bipertita...sub praesidio D. Johannis de Raei, Īv-lvii.

¹⁶⁵ De Grau, Disputatio uranoscopia de cometis.

between supporters of the latter conviction and defenders of the New Philosophy, however, was to be staged in Utrecht.

3. From ominous to glorious signs: the comet of 1664

On 1 April 1662 a disputation was organised in the Atheneum Illustre in Amsterdam on comets with the suggestive title $\Pi PO\Gamma N\Omega\Sigma TIKON$. The eighty-nine theses were defended by a young and promising student of professor De Bie, Nicolaes Witsen (1641–1717). ¹⁶⁶ After studying in Amsterdam, Witsen was later to complete his education in Leiden. He subsequently travelled in Russia and made an impressive career as mayor of Amsterdam and governor of the Dutch East Indian Company. ¹⁶⁷ The orthodox 'amateur' was endlessly fascinated by natural history, the languages of antiquity and remote regions, and assembled a gigantic collection of curiosities.

At the moment when the 21-year-old student defended his disputation, there had not been any appearance of a comet. Academic treatises, harangues and natural philosophical tracts usually surfaced when such a sign had manifested itself in the firmament. A minuscule comet had put in an appearance in 1653, but the last spectacular manifestation had been in 1618. When a gigantic comet appeared in the sky in December 1664, it was likewise accompanied by a spate of spoken and printed words. The theses that Witsen announced shortly before this controversy give a good impression of the gradually changing opinions of the natural philosophers in general, and of his mentor De Bie in particular.

Comets were a hobby-horse of De Bie. In 1653 he had announced that they were signs of God's anger, but by 1662 this was no longer so certain. The nature of comets was still unclear, but they certainly moved high in the firmament. How tenable was the traditional view of Ptolemy and Pliny that the tail of a comet indicated the regions

 $^{^{166}}$ ΠΡΟΓΝΩΣΤΙΚΟΝ quod...sub praesidio D. Alexander de Bie...Defendum publicè suscepit Nicolaus Witsen. Cf. Burger, 'Een disputatio'; Van Miert, Humanism in an Age of Science, 262.

¹⁶⁷ Gebhard, *Nicolaes Witsen*; Peters, 'Nicolaes Witsen and Gisbertus Cuper'; Eadem, 'From the Study of Nicolaes Witsen'; Eadem, *De wijze koopman*.

¹⁶⁸ Afbeelding en situacie des nieuwen en ongewoon-wonderlijke steertsterre; Nieuwe ongewoon-wonderlyke staert-sterre op 't Recif in Brasil gesien.

¹⁶⁹ ΠΡΟΓΝΩΣΤΙΚΟΝ, A1/v.

that would be affected? Since the comet could be seen all over the world, including the Antipodes, it was impossible to assign it a specific meaning. Only God knew what the future held in store. The possibility that a comet was the herald of misfortune could not be ruled out. The comet of 1618, for instance, had been followed by the terrible war in Germany. But De Bie's student was unable to tell whether the comet had announced or caused it, or whether it had been the result of a chance combination of circumstances. At any rate, comets were often regarded by the common people as instruments of divine punishment because the tail of a comet was so much like a rod (flagellum). 170 'Nothing can be determined with certainty about the predictive value of comets', Witsen concluded.171

Almost three years later he was to see a comet with his own eyes. He noted in his Russian travel diary on 6 January 1665 that he had seen 'a big comet star with a hideous tail'. 172 The Czar had instructed two scholars to issue a prognostication, but Witsen does not tell us what that forecast was, nor do we know what Witsen replied when he was asked to give his opinion.¹⁷³ We can deduce from other remarks, however, that many Russians, unlike the majority of West Europeans, saw the comet as a positive sign. Witsen had little sympathy for this idea and considered the opinion of the Russians 'absolutely crazy'. 174 What was a belief for one was superstition for the other. This was true not only of Witsen and the Russians, but also of the scholars in the Dutch Republic who turned their attention to the matter.

A 'new saddening night light'

The comet that Witsen observed from Russia could be clearly seen all over the world. It was first observed from the Netherlands on 2 December 1664 by the Leiden astronomer Samuel Kechel (1611-1668), who described his findings in a letter to Christiaan Huygens and in an anonymous pamphlet.¹⁷⁵ In The Hague, Huygens himself followed the comet's trajectory with great attention. He recorded his findings in loose notes and in a number of letters, among the recipients

¹⁷⁰ Ibid., A2/r.

¹⁷¹ Ibid., B2/v.

Witsen, Moscovische Reyse 1664-1665 I, 85.

¹⁷³ Ibid. II, 198.

¹⁷⁴ Ibid. II, 207-208.

¹⁷⁵ OCCH V, 178-179; [Kechel], Copye van een brieff geschreven uyt Leyden.

of which were Thévenot and the philologist Nicolaas Heinsius (1620–1681), who was very interested in the subject.¹⁷⁶

Huygens and Kechel did not comment on the possible meaning of the celestial body, but they were exceptions. Between 1618 and 1664 writings on comets had had a fairly abstract character. The comet that could be seen now appeared, however, on the eve of the Second Anglo-Dutch War and during a very serious outbreak of the plague that killed tens of thousands in the Dutch Republic. The Characteristic of the atmosphere of these dramatic months was the remark of the Utrecht council of churches that 'vexing idolatry' was now so widespread that 'God in his zeal will exact a terrible vengeance, which appeared to have already begun'. On 21 January 1665 the States-General prescribed a general day of prayer and penitence to avert the impending doom.

Humanists such as Heinsius and Isaac Gruterus (1610–1680), rector of the Latin School in Rotterdam, carefully followed the course taken by the comet. They also noted that the fatherland was in trouble, but was there any connection? Prominent theologians and anonymous pamphleteers had less doubts on the matter. For instance, a well illustrated folio sheet described the comet as heralding a plague epidemic. Voetius, who had already expressed his opinion in previous disputations, now published his views in a separately issued treatise, *Exercitatio de prognosticis cometarum*. He noted that Aristotle's view of comets was controversial: the *phasmata* could be situated in the atmosphere or in the ether. That it was a sign of the Lord, however, was evident, since the world is the Book of Nature in which we read the wisdom, might, goodness and justice of the Creator'. This book, so exuberantly praised by the Psalmist, was as often neglected as the Holy

¹⁷⁶ OCCH XV, 80-92; OCCH V, 209-211; Ibid., 479-482.

¹⁷⁷ De Valk and Noordegraaf, De gave Gods, 107-109; Israel, Dutch Republic, 766-776.

¹⁷⁸ Van Lieburg, Nadere Reformatie in Utrecht, 30.

¹⁷⁹ Kist, Neêrlands bededagen en biddagsbrieven II, 11.

 $^{^{180}}$ Their observations were included in: Lubieniecki, *Theatrum cometicum* I, 243–345; 863–880.

¹⁸¹ Drie aenmerckens-waerdige wonderen in den Jare 1664 't Amsterdam en daer omtrent voorgevallen. See also: Dretgraft, Op de hedendaegse Comeet-Gestarnte; Nieuwe prognosticatie over de Sterre; Klare Afbeeldinge van de Staert-Ster; I.S.V.H. [Six van Chandelier], De ware afbeeldinge van de tegenwoordige staert-sterre.

¹⁸² Voetius, *Exercitatio*. This work was reprinted in 1669, and was also included in: Voetius, *Selectarum disputationum theologicarum partes V*, V 151–243.

¹⁸³ Voetius, Exercitatio, 42.

¹⁸⁴ Ibid., 43.

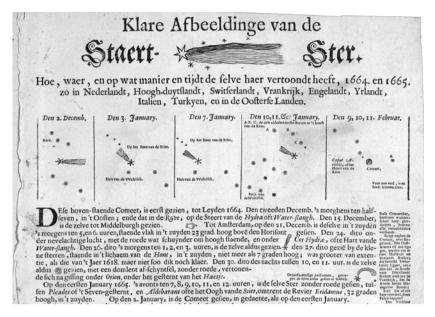


Fig. 22. One of the many Dutch broadsheets in which the course of the comet of 1664 was described. The comet was first observed from Leiden on 2 December by Samuel Kechel (KB).

Scripture, particularly by sceptics and Epicureans. Voetius' Exercitatio clearly shows how he interpreted the liber naturae: on the basis of a number of specific biblical passages, including Luke 21:11 and Matthew 24:29. Comets were no doubt the portenta in coelo mentioned by the evangelists, and as such they heralded God's wrath and drastic changes on earth. Voetius went on to cite all the classical, patristic and contemporary commentators who had previously defended this interpretation, drawing on handy reference works such as the books of prodigies and Vossius' De theologia gentili. That the comet was a sign of God was thus proven.

A pupil of Voetius, the preacher Isaac Clemens (ca. 1632–1666) from Flushing, his Rotterdam colleague the familiar poet-preacher Franciscus Ridderus (1620–1683), and the otherwise unknown Hendrik la Been drove home the same argument. The message that was

¹⁸⁵ Ibid., 44, 92.

¹⁸⁶ Ibid., 26, 49, 56.

¹⁸⁷ Clemens, Sneeuw en vyer-damp; Ridderus, Reys-Discours; La Been, Korte Beschrijvinge Van de hedendaeghsche Comeet-Gestarnte.

expressed in all these printed works was a reflection of the debate on the interpretation of comets that had been conducted in the previous decades: comets were signs of God. Almost all of the authors emphasised that these celestial signs should not be interpreted superstitiously, which boiled down to a general rejection of the method of judicial astrology. A striking exception was the Breda theologian and professor of philosophy Johannes Schulerus (d. 1676), who adopted Ptolemaic techniques without any qualms and gave his Cometologia the overblown subtitle $\Pi PO\Gamma N\Omega \Sigma TIKON$ astrologicum generale. ¹⁸⁸ In his endeavour to make his voice heard in the world of the humanists, Schulerus was rash enough to send a copy to Christiaan Huygens. 189 The latter replied dryly that he saw no virtue in a method of interpretation that was on the same level as chiromancy. 190 The vast majority of authors were in agreement with Huygens on this point. As the orthodox Ridderus put it: telling the future on the basis of 'heathen rules' was 'foolish idleness and heathen superstition'. 191 All the same, it was evident 'that God wants to say something with comets'. The question was simply: what?

Johannes Graevius and the Collège de Sçavants

On 18 January 1665, six weeks after the start of the comet fever, the Utrecht professor of rhetoric and history Johannes Graevius (1632–1703) delivered an oration *De cometis* with the eloquent subtitle *contra vulgi opinionem cometas esse malorum nuncios* (against the common opinion that comets herald disasters).¹⁹² Graevius had pronounced Cartesian sympathies, although he was trained as a philologist. He was a close friend of other less orthodox thinkers such as the professor of philosophy Johannes de Bruyn (1620–1675) and the theologians Frans Burman (1628–1679) and Lodewijk Wolzogen (1633–1690) who, to the chagrin of the Voetians, occupied important chairs in Utrecht.¹⁹³

¹⁸⁸ Schulerus, Cometologia sive de cometis disquisitio philosophica, translated as: Tractaat Ofte philosophische ondersoeckinge Van de cometen. On Schulerus: Sassen, Illustre School te Breda, 94–101.

¹⁸⁹ OCCH V, 252.

¹⁹⁰ OCCH V, 300.

¹⁹¹ Ridderus, Reys-Discours, passim.

¹⁹² Graevius, *Oratio de cometis*; translated in 1682 as *Redenvoeringh ofte oratie van de cometen*.

¹⁹³ Thijssen-Schoute, *Nederlands cartesianisme*, 443–448; Van Bunge, *From Stevin to Spinoza*, 100.

Graevius was an authority in his discipline, published commentaries on Cicero and editions of Hesiod, Suetonius and others, and would later be appointed as the annalist of Willem III, but the celebrated professor was above all a prominent member of the Republic of Letters, as well as a typical exponent of the scholarly culture of the second half of the seventeenth century that took an interest in all forms of knowledge, whether oriental languages or contemporary philosophy. 194 He was an intimate friend of Isaac Vossius and the French savant Melchisédec Thévenot, and informed Leibniz of the latest developments in natural science in the Dutch Republic.195

In the light of this background, it is not surprising that the philologist delivered his verdict on comets. Graevius' argumentation is extremely interesting because it basically differs very little from the attacks on comet fever by Pierre Bayle and Balthasar Bekker of 1681-1683 that are generally regarded as paradigmatic. 196 When Graevius' oration was published at the expense of the Utrecht city administration, it attracted considerable attention at home and abroad and was repeatedly reprinted and translated.¹⁹⁷ Gruterus told a foreign correspondent that the Dutch theologians were up in arms. 198

Right at the start of his oration, Graevius makes it patently clear what his purpose is: to combat superstition. The scholar had unambiguous ideas about what constituted superstition, ideas—as he put it with a sense of understatement—that would not make him popular with a number of colleagues. Still, just as Socrates had put forward his views against prevailing opinion, he would do the same. Belief and superstition were close to one another, Graevius stated, but while the former was the product of love of God and had as its purpose to honour God, the latter was the product of ignorance and led to 'idle fear'. 199 Superstition led to fear of things that should be respected, such as comets.200

Appealing to history to support the ominous interpretation of comets was fruitless. The fact that the Egyptians, Babylonians, Chaldeans,

¹⁹⁴ Cf. Stegeman, Theodorus Janssonius van Almeloveen.

¹⁹⁵ Blok, *Vossius*, 477-482.

¹⁹⁶ Jorink, 'Comets in Context'. Cf. Hazard, Crise, 142-147; Fix, 'Bekker and Bayle'. 197 Graevius, Oratio de cometis. Editio secunda (1681); Idem, Redenvoeringh. See also: Serlin, Cometologia, 209-221; Orationes, quas Ultrajecti habuit, 103-142.

¹⁹⁸ Lubieniecki, *Theatrum cometicum* I, 863.

¹⁹⁹ Graevius, Oratio de cometis, 3.

²⁰⁰ Ibid., 23.

Greeks and Romans had interpreted comets as omens or prodigia was not a model for us. Many errors had been proclaimed in antiquity; the ancients simply did not know all the mysteries of nature. Since their time numerous new stars had been discovered, and astronomers had demonstrated that Jupiter had moons and that Saturn was encircled by a ring. Graevius summed up the highly diverse classical theories of comets, but eventually concluded that none of them was correct. Philosophers still disagreed on their nature. Still, two facts were patently clear. First, Aristotle was wrong: comets clearly move above the moon. Second, Graevius claimed that comets obey 'those laws which nature or the supreme appointer and author of nature have laid down for them'.201 We can hear the echo not only of Descartes but also of Seneca. Comets, Graevius argued, were among God's eternal works and, like all other 'heavenly things', they were subject to immutable laws. 202 Comets had appeared with a certain regularity since the Creation, some of which had been observed, although the majority had passed unnoticed. How could such frequently appearing phenomena function as heralds of all disaster on earth? Comets were seen all over the world. so how could one and the same celestial body have the same ominous significance for Chinese, Africans, West Indians (i.e. Americans), Germans and Italians at the same time? Good fortune for one people meant bad fortune for another. Besides, earthly affairs were independent of the eternal laws of nature that propelled comets. There was no causal connection at all. 'Leaf through the right books, search the histories, and you will always come across many wars and few comets'.203 The reason why experience and the chronicles seemed to teach that comets were harbingers was that earlier writers were wrong in seeing a connection between the different events. Lessons of many kinds could be drawn from history, but the mental world of antiquity was fundamentally different from that of the seventeenth century. Anyone who appealed to the 'long-term experience of so many centuries' could also approve of

prophecies based on the flight or song of birds, the inspection of the entrails of sacrificial animals, the casting of lots, the birth of malformed creatures, dreams, or lightning—which earn universal disapproval.²⁰⁴

²⁰¹ *Ibid.*, 28.

²⁰² *Ibid.*, 28-29.

²⁰³ *Ibid.*, 41.

²⁰⁴ *Ibid.*, 11.

Graevius is evidently elaborating on a theme that had been tackled earlier by Saumaise and others.

Graevius' critical reading of the classical tradition was also applied to the Bible. The Voetians appealed above all to the Holy Scripture to demonstrate that comets were signs of God. Graevius considered this incorrect. Jesus, he argued, had indeed spoken about 'great signs from heaven' in the Gospel according to St Luke, but they must have been supernatural signs 'in opposition to the laws and order of nature', such as the star of Bethlehem or the fiery column that guided the people of Moses through the wilderness.²⁰⁵ Luke 21:11, Graevius argued, was clearly explained by Matthew, Mark and Isaiah, referring to 'unprecedented' signs in the firmament, namely 'signs in the sun, and in the moon, and in the stars'. 206 If God had wanted his creatures to regard comets as signs, the Holy Scripture would have been more explicit about the fact. This crucial point was further emphasised in the dedication of the published oration: 'I have been strongly confirmed in my view because the whole Bible nowhere makes mention of comets. This is so clear that it has no need of confirmation'.207

After this rejection of the interpretation of comets as omens, Graevius imparted a new twist to the discussion. Comets were signs, not of God's wrath, but of his almightiness. Comets, like all other celestial bodies, obeyed God's eternal laws, 'which will always be permanent and immutable until the building of this world shall be demolished'. 208 Graevius noted the existence of confusion regarding their nature, and he also cited Seneca's remark (without attribution) that the future will teach what exactly comets were. Nevertheless, with a reference to his colleague De Bruyn, he suggested that the tails of comets were nothing but rays of the sun that present the appearance of a tail through reflection, 'according to the order of nature'.209 And how could such a divine creation as the sun either cause or predict imminent divine punishment? In the spirit of the Stoa, Graevius claimed that comets were too rare to pass unnoticed:

For what is more beautiful, more delightful, more pleasant, than these heavenly fiery balls, with which the open and unlimited fields of the

²⁰⁵ Ibid., 48.

²⁰⁶ *Ibid*.

²⁰⁷ Ibid., 8.

²⁰⁸ Ibid., 32.

²⁰⁹ Ibid., 31. See also: Graevius, Oratio funebris in obitum...Iohannis De Bruyn, B3.

heaven, like a garden with pleasant flowers, are decked and diversified with astonishing variety and beauty by the immortal creator and overseer of this universe.²¹⁰

The laws of nature were manifestations of God's goodness. All celestial bodies were subject to them: planets, stars, the moons of Jupiter, eclipses, novae, and comets. The latter should therefore be viewed 'with wonder and delight' as signs of the immeasurable richness of nature and the almightiness of its creator.²¹¹

Graevius' Utrecht oration was not an isolated phenomenon. His friends and colleagues De Bruyn, Wolzogen, Mansfelt and Burman voiced similar opinions at the same time in their sermons and lectures. We know from a letter of Graevius to Heinsius that the circle of the collège des sçavants met every week during these years to discuss all kinds of philosophical issues, very much like the Académie of Graevius' friend Thévenot. 212 The group is known above all for an extremely hostile Voetian pamphlet directed against its members. 213 This anonymous tirade presented a portrait of a hotbed of hotheads who intended, with the tacit approval of the local government, 'to eradicate the true Godfearing and pious lovers of Church and Prince, and to propagate the Cartesian philosophy with other related novelties'. The perfidious objectives, according to the pamphlet, were revealed in their true guise when the collège rose as one man to combat the fear of comets. While the 'terrifying comet' had appeared, the fatherland was in disarray, and the pious Voetius preached repentance, 'the old man was attacked with full force'. 215 To crown it all, Graevius had been honoured with an oxhead of wine by the provincial authority in gratitude for his oration. 216 The pamphlet also stated that Wolzogen had claimed in two sermons that Jeremiah 10:2 should be interpreted as a condemnation, not a justification, of the fear of comets. Indeed, from the pulpit, Mansfelt

²¹⁰ Graevius, Oratio de cometis, 22-23.

²¹¹ *Ibid.*, 35.

²¹² Sylloges epistolarum IV, 489-490; Vermij, 'Genootschappen en Verlichting'.

²¹³ Het collegie der scavanten van Utrecht. See also: Burman, Redenvoering voor de comedie, 'Voorreden'; Hartog, 'Het collegie der scavanten'.

²¹⁴ Het collegie der scavanten van Utrecht, A2/r

²¹⁵ *Ibid.*, B2/v.

²¹⁶ Ibid., B3/r.

declared preachers 'who maintained the contrary' heretics.²¹⁷ Burman taught that all the celestial lights had been created on the fourth day, and that the biblical condemnation of astrology also applied to comets.²¹⁸ In a disputation, De Bruyn defended the thesis that fear of comets was an unpardonable sin. 219 Soon afterwards Van Velthuysen made the same pronouncement in his notorious Tractaet van de afgodery en superstitie (Treatise on idolatry and superstition).²²⁰

The impression that this offensive made on orthodox Utrecht was one of a monstrous conspiracy.²²¹ The decades of controversy on Cartesianism and Copernicanism had already caused feelings to run very high, and this was further provocation. It is no accident that it was the Voetian camp that produced so many writings on the comet. 'Let them make a fuss if they like', Voetius appears to have grumbled, 'God will indeed show that the comets are ominous portents'.222

Natural laws and exegesis

At first sight Graevius' oration, like Bekker's Ondersoek and Bayle's Discours, seems to represent a victory of Enlightenment over tradition, and the dispute between the collège des sçavants and the Voetians on the comet of the plague year of 1664 has been interpreted in this way.²²³ However, some further remarks are called for here.

In the first place, the rhetoric of both Graevius and Voetius obscures the fact that they were both agreed on important points. An astrological interpretation of comets in the spirit of Ptolemy was firmly rejected. An appeal to the Bible excluded the role of judicial astrology in scholarly discourse. Voetians and scavants were also basically in agreement that God could give signs in the heavens, even though the Voetians went much further than Graevius in this respect. The authenticity of miraculous signs in the Bible such as the famous passage on the sun and moon standing still in Joshua 10 and the supernatural

²¹⁷ *Ibid.*, B3/r.

²¹⁸ Ibid., B3/r; Burman, Synopsis theologiae I, 298–302.

²¹⁹ Het collegie der scavanten van Utrecht, B3/r; De Bruyn, Disputatio de specialibus.

²²⁰ Van Velthuysen, Tractaet van de afgodery en superstitie, 84-86.

²²¹ Burman, Redenvoering, 'Voorreden'.

²²² Collegie, B3/r.

²²³ See for example: Knuttel, Balthasar Bekker, 150; Israel, Radical Enlightenment, 378. Both authors write that Graevius' Oratio first was published in 1681.

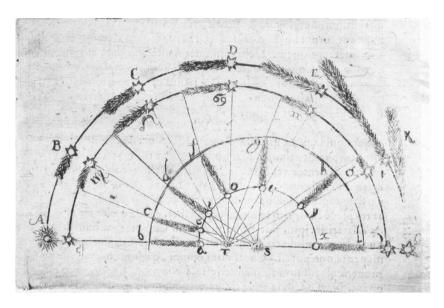


Fig. 23. In 1666 a student of the Leiden professor Johannes de Raey, Johannes Kopeczy, defended the thesis that comets moved in circles, in an attempt refute the theory of Descartes (UBL).

darkness at Christ's crucifixion was beyond all doubt. Christ's Second Coming would be announced by signs in the sky just as the evangelists had described. But while for Graevius biblical miracles and natural order were two separate worlds, they were one for Voetius. The latter claimed that the 'signs in the sun, and in the moon, and in the stars' mentioned in *Luke* undoubtedly also referred to comets. Graevius' position on this point was that they should be *supernatural*, unprecedented signs.

Graevius' argumentation takes on an apparently modern appearance through the consistent reference to the laws of nature. Impressive though the term may sound, and in spite of the fact that its use suggests that the time-hallowed enigma of the nature of comets had been solved, nothing was further from the truth. Graevius seems to have shared the hypothesis to which De Bruyn, Kepler and others adhered, namely that comets were a sort of cosmic lens, but nowhere does he make his standpoint explicit.

The explanations advanced by scholars in the Dutch Republic and abroad around 1664 were diverse. For Descartes, comets were particles

of matter that were propelled by vortices (a theory that Graevius did not accept). Christiaan Huygens at this time believed that they were objects that shot through the universe in practically straight lines like rockets.²²⁴ Lesser lights supposed that a comet was 'a fiery ball in the firmament that dissolves as it is consumed by fire', if they concerned themselves with the problem at all.²²⁵ The same cacophony on the nature of comets characterised the rest of Europe. The only point on which most scholars were in agreement was that comets had natural, not supernatural causes—but even that was nothing new; Aristotle had claimed the same

If we examine more closely what Graevius meant by the term 'laws of nature', we find that this expression had a strongly programmatic and rhetorical value for adherents to the New Philosophy.²²⁶ Beneath the banner of the laws of nature, they declared war on all those who refused to recognise Reason as the primary source of knowledge. It is difficult to overestimate the force that the term 'law of nature' exerted. It functioned in this context as a wedge between scholastic and Cartesian epistemology.

This brings us to the underlying, second line of Graevius' attack: the textual and historical tradition. This is where the fundamental conflict between Voetius and Graevius emerges. According to Voetius, comets were signs of God. To support this claim, the theologian referred to a very impressive list of contemporary and above all ancient authorities. Much more important, however, in his eyes, was the fact that the Bible stated that comets were signs of God. This was an exegetical problem of the first order, as nowhere are comets mentioned explicitly in the Holy Scripture. Voetius, who time and again stressed that only the Holy Scripture was the key to understanding the Book of Nature, and who had a very strong leaning towards literal biblical exegesis, reluctantly had to admit that there was perhaps a minor complication here. He went into the matter in more detail in his Exercitatio de prognosticis cometarum. His first argument was that, since the gospels according to Matthew and Luke both referred to portenta in coelo, these must include comets. Apparently Voetius himself

²²⁴ OCCH XV, 80-92; OCCH V, 210-211.

²²⁵ La Been, Korte beschryvinge, A3/r.

²²⁶ Vermij, 'Wetten der natuur', 111-112.

realised that this argument by analogy was not entirely convincing, because he went on to provide a second argument, which was actually completely at odds with his own exegetical principles: not everything that could be read in the Book of Nature was described in the Bible.²²⁷ Experience and reason confirmed the truth of *Romans* 1:19–20, namely that through the Creation God also revealed himself to those who had not read the Bible. Comets, like other *prodigia*, were signs of God. This is a very clear example of how the Bible provided Voetius with an arsenal of texts designed to back up orthodox doctrine.

While Voetius considered biblical and classical passages to be fully applicable to his own day, Graevius criticised this attitude. The 'common opinion' regarding comets was not dictated by God's word, but was the result of ancient superstition. The revealed character of the Bible was also beyond all doubt for Graevius. He barely succumbed to the temptation to make exegetical pronouncements, apart from the withering statement that the Holy Scripture nowhere explicitly refers to comets. Graevius, however, criticised the broader, literary context: antiquity was a closed period in which people had entertained fundamentally different ideas about a lot of matters from what his contemporaries now believed. The often incorrect deductions that earlier authors had made should not be believed on the basis of arguments of authority alone.

It is interesting that as soon as his *Oratio* was in print, Graevius sent a copy to a philologist whom he greatly admired: Isaac Vossius. Vossius was extremely interested in comets. After stirring up considerable controversy with his biblical criticism, he turned to natural philosophy in the 1660s with seemingly playful ease. He often attended the *Académie* of Thévenot, and had no difficulty in publishing on the nature of light (an issue on which he crossed swords with De Bruyn).²²⁸ In 1665 Christiaan Huygens mentioned that Vossius had a gigantic '28 or 29 foot telescope'.²²⁹ Pierre Petit, a mathematician from Thévenot's circle, sent Vossius his famous *Dissertation sur la nature des comètes*.²³⁰ Vossius too wanted to find a physical explanation for comets (which

²²⁷ Voetius, Excercitatio, 91.

²²⁸ Vossius, *De lucis natura*; Idem, *Responsum ad objecta Joh. de Bruyn*. See: Dijksterhuis, 'Development of Isaac Vossius' Opticks'.

²²⁹ OCCH V, 391–395.

²³⁰ OCCH V, 206-208.

he believed to lie in the laws of optics), but made no mention of any possible meaning that they might have.²³¹ In the letter accompanying the gift of the Oratio, Graevius explained in the humblest manner that he would appreciate Vossius' verdict on the work that he had written in connection with an 'irritant occasion', in spite of the fact that it probably did not contain anything new.²³² He hoped to be able to return to more serious matters, such as his editions of Hesiod and Lucian. Although Graevius did not mention Vossius' work anywhere in the Oratio, it is natural to suppose that his critical reading of the ancient sources was partly inspired by the author of De vera aetate mundi and De septuaginta interpretibus.²³³

Similar remarks apply to Graevius' colleague in the theological faculty, Lodewijk Wolzogen. As far as we know, the relevant sermons of this theologian with a very worldly reputation are not extant, but it is known that he took Jeremiah 10:2 as his point of departure. 234 Wolzogen will have argued that this verse should be interpreted as a biblical condemnation of astrology in general, and of fear of comets in particular. Wolzogen probably went extensively into the fact that comets are not mentioned in any passage of the Bible. However that may be, we know from other sources that Wolzogen favoured a moderately rationalistic biblical hermeneutics.²³⁵ In his view, God was the author of the Holy Scripture, but almost everything it contained could be understood by human reason. It contained some truths that were beyond the reach of reason (such as the mystery of the sacred Trinity), but none that ran counter to reason. Reason cannot be in contradiction to God's word as revealed in the Bible, and is essential for an understanding of that word.236

The Utrecht scavants clearly touched on a sensitive issue with their references to the basic text of the Bible, but they were not the only ones. The Groningen theologian Maresius, certainly no friend of the Cartesian-Cocceian camp, joined with them in rejecting the notion

²³¹ Vossius, Appendix de natura lucis in: Idem, De Nili origine, 135–145.

²³² BLO Ms d'Orville 470, fol. 57-59.

²³³ Graevius was also a friend of Richard Bentley (1662-1742) see: Brink, English Classical Scholarship, 61-62.

²³⁴ Het collegie der scavanten van Utrecht, B3/r.

²³⁵ Lettres sur la vie et la mort de monsieur Louis de Wolzogue, 9-10.

²³⁶ Wolzogen, Libri duo de scripturarum interprete. See: Van Bunge, From Stevin to Spinoza, 99-100; Israel, Radical Enlightenment, 205-208.

that comets were ominous portents, as there was no mention of these signs in the Holy Scripture.²³⁷ From Middelburg the preacher and natural philosopher Johannes de Mey spread a similar message.²³⁸ This eclectic—De Mey was also influenced by Descartes and Cocceius—claimed that the biblical passages on the *portenta in coelo* are prophetic, and therefore should not be taken literally. Referring to Gerardus Vossius' *De theologia gentili*, De Mey affirmed that fear of comets was heathen superstition, but that Christians should look upon these miraculous works of God with wonder.

If we turn to the relation between the Bible and the Book of Nature, the pertinent view of Voetius that the *liber naturae* could only be understood on the basis of a literal reading of the Holy Scripture was opposed by a growing tendency to regard nature as a relatively independent source of knowledge of God, and to read the Bible following the principle of accommodation in the spirit of Calvin and Wittich. More scope was given to philosophy. This enabled arguments based on natural theology to occupy a more prominent position, but the same applied to deistic, materialist or even atheistic views. The exceptionally heated nature of the debate on comets was partly due to Voetius' fervent opposition to any form of biblical interpretation that differed from his. If non-biblical resources, such as Reason, were introduced, as some members of the *collège des sçavants* seemed to do, then matters would get completely out of hand.

The validity of this fear would very soon be vindicated. An anonymous work by Lodewijk Meijer (1627–1681), *Philosophia S. Scripturae interpres* (Philosophy interpreter of the Holy Scripture) was published in 1666.²³⁹ Meijer was a friend and possible inspirer of Spinoza who followed essentially the same direction as Wolzogen but went much further. He claimed that Reason was the *sole* interpreter of the Holy Scripture. The book caused a general commotion, and not only among

²³⁷ An extract of the disputation of Maresius, *De stella quae Magis fuit visa* was included in the second edition of Graevius, *Oratio* (1681) 49–58. Cf. Nauta, *Maresius*, 39, 333; Van der Wall, *Serrarius*, 316–337.

²³⁸ De Mey, Appendix altera, de natura cometarum & vanis ex iis praedictionibus in: Goedartius, Metamorphosis et historia naturalis insectorum...Cum commentariis D. Joannis de Mey, 201–235.

²³⁹ Israel, Radical Enlightenment, 197-217; Van Bunge, From Stevin to Spinoza, 94-117.

Voetians. Wolzogen hastened to refute the work, but in doing so he explicitly drew attention to his own unorthodox views.²⁴⁰ In the eyes of the Voetians this was a sham attack, and the books by Meijer and Wolzogen were birds of a feather. Friends of Wolzogen were obliged to draw up a testimony in 1669 that confirmed his orthodoxy. The signatories included Johannes Cocceius, Frans Burman, and—significantly for this chapter—Balthasar Bekker.²⁴¹

Graevius also seemed to have manoeuvred himself into a difficult position when Spinoza's *Tractatus* appeared at the end of 1670, a work which drew a logical but alarming conclusion from the concept of laws of nature that Descartes had formulated and Graevius had cherished. According to Spinoza, 'we cannot infer from miracles either the essence or the existence, or the providence, of God, but on the contrary that these are far better inferred from the fixed and immutable order of nature'. 242 That meant that the laws of nature which applied in his day were the same as those of the Old Testament period. In other words, if we take the Holy Scripture literally, the miracles described in it were impossible. The possibility that natural phenomena could have a supernatural message was thus excluded. For instance, Spinoza had the following to say about one of the popular signs from the Book of Nature: 'At Genesis 9:13 God informs Noah that he will put a rainbow in the clouds. This action of God's is assuredly no other than the refraction and reflection affecting sun rays seen through drops of water'.243 Spinoza thus went much further than the sçavants, who had been relatively reticent with regard to the text of the Bible. Graevius, who knew Spinoza personally, was apparently so shocked by the implications of Spinoza's Bible criticism that he tried to distance himself from the philosopher.²⁴⁴ In a letter to Leibniz he cried out against

²⁴⁰ Wolzogen, Libri duo de scripturarum interprete; Israel, Radical Enlightenment,

²⁴¹ Jugemens de plusieurs professeurs. See: Thijssen-Schoute, Nederlands cartesianisme, 49; 446–447.

²⁴² Spinoza, Theological-Political Treatise, 84.

²⁴⁴ Cf. Spinoza to Graevius, 14 December 1673 (Ep. 49), Wolf ed., The Correspondence of Spinoza, 268-269.

'a Jew called Spinoza' who had published a 'very pestilential book'.²⁴⁵ Van Velthuysen rapidly distanced himself in a similar way from the author who claimed that miracles are subject to the general laws of nature.²⁴⁶ That was not what the *sçavants* had had in mind.

Seen in this light, the Utrecht debate on the comets was a facet of a much more complex whole. No less than the authority of the word of God was at stake. As Van Bunge wrote:

For decades to come biblical literalists, emphasizing the divinely inspired nature of the whole of Scripture, would find ample opportunity to slur any deviation from the literal interpretation of the Bible with the invective of 'Spinozism'.²⁴⁷

As far as comets were concerned, the Voetians persisted in believing that their ominous significance had a biblical basis. The debate on the interpretation of the 'heavenly signs' was not yet over.

4. Conceptions of comets around 1700

'It is some time since there has been talk of a comet', Christiaan wrote to his father from Paris on 27 December 1680 after the appearance of another comet. 'The weather is fine today, which will attract a mass of people to the observatory this evening, for they...claim that astronomers should account for this phenomenon, and even what it signifies'. 'His brother Constantijn junior was grappling with the same problem in The Hague. 'You should send me something on the comet', he begged Christiaan, 'to give me material to reply to all the people who ask me every day'. 'Christiaan was not the person to give all the curious an answer. Huygens continued to grapple with the mathematically extremely complicated course of the comet, and the idea that this celestial body had any significance was totally alien to him. 'Soo

²⁴⁵ Leibniz, Sämtliche Schriften und Briefe Ie reihe, I, 142. Cf. Sylloge epistolarum IV,

²⁴⁶ Van Velthuysen to Ostens, 24 January 1671 (Ep.42), Wolf ed., *The Correspondence of Spinoza*, 239–254. See also: Van Bunge, 'Velthuysen, Batelier and Bredenburg'.

²⁴⁷ Van Bunge, 'Bekker's Cartesian Hermeneutics', 69.

²⁴⁸ OOCH VIII, 312.

²⁴⁹ OOCH VIII, 316.

²⁵⁰ See, for example: OCCH XV, 122-129.

Huygens' attitude is characteristic of the change that had taken place in conceptions of comets. While in the past thinking about their cause and speculating about their significance had mainly been carried out together, and natural philosophers, theologians and humanists stated roughly the same view, there was now a clear-cut differentiation. At one end of the intellectual spectrum were the theologians, who were mainly concerned with what had become the urgent question of whether or not there was biblical legitimation for the fear of comets. At the other end were mathematicians of the calibre of Huygens as well as less gifted ones such as Dirck Rembrandtz van Nierop (1610–1682) and Dirck Mackreel in North Holland, who had been purely interested in the physical aspect of the matter since 1664.²⁵¹ Van Nierop believed that 'comet stars are produced by sunspots', but made no comment on any significance.²⁵² Mackreel dismissed the latter speculations as 'foolish dreams'.253

The comet that appeared in 1680 and reappeared the following year after its perihelion, as well as the far more striking comet that was observed in the autumn of 1682, led once again to heated discussions all over Europe.²⁵⁴ It was in connection with these comets that Newton and Halley formulated their hypothesis on the elliptical course of the comets, and that Bayle and Bekker published their famous treatises against the fear of comets. In addition, earlier discussions were reprinted, such as Graevius' Oratio, which now also appeared in a Dutch translation. But the Voetian camp was not silent either.

Voetians on the Book of Nature

'Has not the Lord threatened and warned us by means of great signs in the heaven, like those of which Christ speaks in Luke 21:11?', the preacher Jacobus Koelman rhetorically asked in 1682.²⁵⁵ This sworn enemy of Cartesians and followers of Spinoza was appalled to have

²⁵¹ Van Nierop, Eenige oefeningen, 63-84; OCCH VI, 540; Mackreel, Waernemingen en consideratien. On Van Nierop and Macreel: Vermij, Calvinist Copernicans, 193-212.

²⁵² Van Nierop, Eenige oefeningen, 64.

²⁵³ Mackreel, Waernemingen en consideratien, 8.

²⁵⁴ Yeomans, Comets, 95–139; Genuth, Comets, 133–177.

²⁵⁵ Chliarander [=Koelman], De vruchteloose bid-dagen van Nederlandt, 3.

to note that the time-hallowed belief regarding comets was increasingly being mocked by 'some teachers', including Burman and Wolzogen, of whom he nourished an intense hatred. In Voetian circles the standpoint was that biblicism, the cornerstone of orthodoxy, was unshakeable. All the same, they were not insensitive to more recent developments, as can be seen from the Cometographia by Gisbertus de Cocq (1630–1708) of 1682. The preacher explicitly appealed to 'the very learned and solid treatise of the famous Gisbertus Voetius'. 256 The theories of Descartes were discussed in detail before eventually being categorised as figments of the imagination and dreams.²⁵⁷ Comets were indeed the consequence of natural causes, but they derived simply from God's almightiness. In principle the same applied to a comet as to a rainbow: 'although it is a natural matter, it also has a supernatural meaning'. 258 De Cocq contradicted the view of Burman and his colleagues that comets were not mentioned anywhere in the Bible. They followed a course high in the sky, and could thus be qualified as stars, and it was precisely the falling of stars and other celestial signs, according to biblical passages, by which God announced his wrath.

The same message was driven home by others who shared De Cocq's views. A year earlier the Leeuwarden preacher Johannes van der Holst (1640–1691) had published a *Tractaat van de tekenen des hemels* (Treatise on heavenly signs) which was reprinted until late in the eighteenth century. Van der Holst was not unfamiliar with the contemporary hypotheses either and noted the great confusion that existed on this score. Still, he claimed, however that may be, the comet that had just appeared was a sign from the Book of Nature:

[God's] words as written both in the Book of Scripture and of Nature, containing his word of warning of threats and the announcement of God's judgements, for all works and signs are the voice of God who summons, exhorts and stimulates us, *Exod.* 4:8.²⁵⁹

God is revealed in the Holy Scripture and in nature, he repeated: 'in both is a voice of the Lord, at which mankind should tremble'. ²⁶⁰ Voetius

²⁵⁶ De Cocq, Cometographia ofte comeetbeschrijvinge, 120.

²⁵⁷ *Ibid.*, 44.

²⁵⁸ *Ibid.*, 55.

²⁵⁹ Van Holst, Tractaat van de tekenen des hemels, 19.

²⁶⁰ Ibid., 39.

had also appealed to the doctrine of the Book of Nature to add strength to his argument. De Cocq held virtually the same opinion.²⁶¹ The Lord speaks to people not only through the Holy Scripture, but also

in the Book of Nature through his great miraculous works in heaven and on earth. If we are not moved by his word in the Holy Scripture nor his ordinary great works in nature to fear him and to show him the service, respect and obedience owing to him, he is accustomed to send comets now and then and to produce other prodigious signs in the heaven and elsewhere by which, like a trumpet call, to correct the godless world and to rouse it from the deathly slumber of negligence.²⁶²

For decades the Voetians continued to refer to the familiar passages in order to cling consistently to the belief that comets were signs of God's wrath. The persistence with which they did so was partly due to the fear that the application of the principle of accommodation and with it of reason would undermine the status of revelation.

Balthasar Bekker

The arguments that the Utrecht scavants had adduced against the fear of comets in 1665 were to a large extent derived from the biblical condemnation of astrology. Graevius had already noted that comets were nowhere explicitly mentioned in the Bible, but had been unable or unwilling to expand this further. In 1683 a theologian, Balthasar Bekker, did feel called upon to do so systematically. He is mainly known for his controversial De betoverde weereld (The enchanted world, 1691-1693), which was to become one of the most widely discussed books of the time throughout Europe.²⁶³ This work is often regarded as the application of Cartesian dualism to the question of magic and witchcraft and thus to have contributed to the disenchantment of the world.²⁶⁴ Leaving that interpretation aside, we shall concentrate instead on the work that Bekker published in 1683, Ondersoek van de

²⁶¹ Voetius, Exercitatio, 43-44, 92.

²⁶² De Cocq, Cometographia, 'Voorrede'.

²⁶³ Knuttel, Balthasar Bekker; Van Sluis, Bekkeriana; Fix, Fallen Angels; Van Bunge, From Stevin to Spinoza, 137-148; Israel, Radical Enlightenment, 377-405; Nooijen, Unserm grossen Bekker ein Denkmal?

²⁶⁴ See for example: Van Ruler, 'Minds, Forms and Spirits'; Israel, Radical Enlightenment, 382.

betekeninghe der kometen, by gelegentheid van de genen die in de jaren 1680, 1681, 1682 geschenen hebben (Investigation of the significance of comets, on the occasion of the appearance of the comets of 1680, 1681, 1682).²⁶⁵

When Bekker published this work, his reputation was already tarnished by unorthodoxy. ²⁶⁶ The malicious author of *Collegie der scavanten* in 1674 had already claimed that the Utrecht clique made common cause with this Frisian proponent of 'non-scriptural and dangerous theses'. ²⁶⁷ Bekker had indeed embraced Cartesianism around 1665 and supported Wolzogen, for example, as 'a great theologian' when the latter was at risk of being crushed between the *Philosophia S. Scripturae Interpres* and the Voetians. Bekker's work on comets also has similarities with Graevius' *Oratio*, though it nowhere cites from it. ²⁶⁸

Bekker's *Ondersoek* appears to have been based on a series of sermons that he delivered in Amsterdam. He began with an indicative lesson from the Book of Nature: God revealed himself 'first in nature, and afterwards in the Scripture'. God's greatness was patently clear from the Creation, and besides through nature he could give more specific signs, Bekker claimed. The latter could be of two kinds. First there were the natural signs, like those described in *Luke* 21:29–33: the fig tree, when it shoots forth, announces the summer. But there were other phenomena whose significance was not a direct consequence of their physical constitution, but which had to be understood with the help of the Bible. Bekker came up with the familiar example of the rainbow. It had a natural cause and even obeyed the laws of optics, but nothing in the phenomenon itself indicated that it referred to something else. However, it was clear from *Genesis* 9:13 that it was a sign, 'instituted by God', and with a very specific message.²⁷⁰

On the basis of this distinction, Bekker went on to consider comets. Were they natural signs? Bekker stated that both natural philosophical writings and the Bible were vague when it came to physical

²⁶⁵ I used the second edition of Bekker, Ondersoek (1692).

²⁶⁶ Van Sluis, 'Balthasar Bekker in 1683'.

²⁶⁷ Collegie der Scavanten tot Utrecht, B2/r.

²⁶⁸ Bekker owned a copy of Graevius' work: *Catalogus librorum D. Balthasaris Bekker*, 54, reprinted in: Van der Sluis, *Bekkeriana*.

²⁶⁹ Bekker, Ondersoek, 1. See also: Bekker, Leere der gereformeerde kerken, 44.

²⁷⁰ Bekker, Ondersoek, 11.

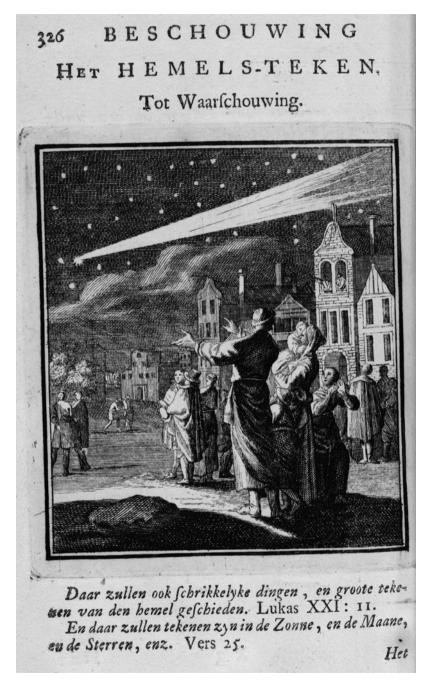


Fig. 24. Until far into the eighteenth century, orthodox Calvinists referred to lines such as Luke 21:11 the Bible in order to defend the idea that comets were sent by God 'as a warning', as in Jan Luycken's Beschouwinge der wereld (1708) (KB).

explanations. Philosophers had issued the most divergent explanations since time immemorial. As for his contemporaries, Bekker referred to the theories of Descartes, Bernoulli and Hevelius, but ended with the words 'What is one to conclude, when one says this and the other says that, voicing not only different but also contradictory opinions?'.²⁷¹ The conclusion was clear: since the nature of comets was unclear and their appearance could not be causally connected with events on earth, they were at any rate not *natural* signs. 'The preceding proofs are such that no escape is possible'.²⁷²

In response to the question of whether comets were miraculous signs instituted by God, Bekker replied that they were nowhere explicitly mentioned in the Holy Scripture. 'The almighty and all-wise Creator never threatened harm without giving it a name, as his Holy Book attests'.²⁷³ Bekker then went exhaustively through all the passages referring to celestial signs in a more general sense; more than half of the 100 pages of the *Ondersoek* consist of exegesis. Bekker was vigorously opposed to the Voetian interpretation of the Bible, and accused his opponents of using twisted arguments to give the interpretation of comets as omens a biblical foundation.

Those who have read the whole Bible many times with care in their own or in the original languages will be in full agreement with me. After all, those who appeal to the Scripture must face the challenge of coming up with at least a single passage that would point in that direction.²⁷⁴

The arguments of orthodox theologians are refuted with an appeal to the original Hebrew and Greek texts. The Bible often refers to signs in heaven (for example, *Genesis* 15:5, 22:17, 26:4; *Exodus* 32:13; I *Corinthians* 27:23; *Jeremiah* 33:22, etc.), but nowhere does it literally refer to comets. Some phenomena, such as the motionless sun (*Joshua* 10:12) or the fiery column in the wilderness (*Exodus* 13:21) are one-off events instituted by God's will. Other apparent references to 'heavenly signs' as mentioned by the prophets (for example, the rod of an almond tree in *Jeremiah* 1:11 and the rod in *Micah* 6:9) are not references to comets: 'I do not think that anyone will deny that all these signs are

²⁷¹ *Ibid.*, 18. On Hevelius and Bernoulli see: Ruffner, 'Curved and Straight'.

²⁷² Bekker, Ondersoek, 37.

²⁷³ *Ibid.*, 39.

²⁷⁴ *Ibid.*

to be understood figuratively, just as they were seen figuratively rather than actually'. 275 The same applies to the 'heavenly signs' mentioned in the gospels and the Revelation of St John. According to Bekker there is no question of comets in them, and these passages should likewise be interpreted 'figuratively and as similes'.276

At this point Bekker places his cards on the table. He counters the Voetians (without explicitly mentioning them) with the biblical hermeneutics of 'two great commentators on the texts, Calvin and Cocceius'.277 He is thus openly admitting to adhere to the theory of accommodation that was so looked down upon in orthodox circles. For the interpretation of Luke 21:11 and Mark 13:24-25, which were so popular in Voetian circles, Bekker cited Calvin's commentary in full. For instance, the words 'the stars of heaven shall fall' in Mark do not mean that they will actually fall, 'but that they will seem to do so to human observers'. 278 The tremors of the earth would be so strong 'that the stars themselves seem to fall'.279 So the Bible adapts to everyday usage.

This passage does not refer to miraculous signs, but to the end of all things...Behold! That is all, Christian reader, that the Holy Scripture has to say about heavenly signs. However hard the search, however brief the reflection: we do not find the slightest mention of comets.²⁸⁰

Those who believe otherwise 'deprive him [God] of his supreme authority and mislead themselves through their obstinate religion'. 281

On the other hand, Bekker agrees with the Voetians in considering the Bible to be clear enough about the fear of celestial signs. Referring to Jeremiah 10:2 and other passages, he claims that the interpretation of such signs is in conflict with God's word, and is essentially a heathen practice. Telling the future on the basis of comets is nothing but accursed astrology. Comets are phenomena that 'the ancient Romans called ostenta, portenta, prodigia, and which Christianity forbids us to

²⁷⁵ *Ibid.*, 51.

²⁷⁶ *Ibid.*, 56.

²⁷⁷ Ibid., 93.

²⁷⁸ *Ibid.*, 56.

²⁷⁹ Ibid., 56.

²⁸⁰ Ibid., 57.

²⁸¹ *Ibid.*, 72

believe in'.²⁸² Only God knows what the future holds in store, Bekker writes, referring to *Deuteronomy* 29:29, *Proverbs* 27:1 and other passages. He therefore concludes that comets are not ominous portents, since 'nature offers no proof of that, and the Scripture is silent; and where it does say something, it is the opposite'.²⁸³

But unlike the Voetians, he thought it natural for people to be filled with wonder at such signs, and not with fear. 'My children', Bekker writes, 'who have no prejudice, were delighted by the sight of the comet, and could hardly sleep calmly without seeing it first'. Paparently the human spirit was initially receptive to God's revelation in nature, and in the second instance to his word. Bekker adds at this time: 'For my part, I regarded it with pleasure and wonder as a sign of the glory of the Creator, like David in *Psalm* 8'. The heaven was the work of God's fingers, and comets were 'wondrous glosses with which the supreme architect paints his heavenly vaults'. Alas, Bekker goes on, most people do not read the Bible properly and they know nothing at all about nature. They look at the sky 'as a cow looks at a new shed'. As a result, they fail to see God's glory where it is most clearly visible: in the Book of Nature.

It explains more clearly to us the greatness and use of his mighty works; and the two books of nature and grace, when read and understood properly, give people a complete picture of the heaven and the stars.²⁸⁸

Nature and the Bible are each *separate* books of God, Bekker argues; one shows his almightiness, the other his goodness. They are complementary, but not identical. Each must be studied in its own way since, as Bekker formulated it in a different context: 'Blessedness cannot be learnt from nature, nor natural things from the Scripture'.²⁸⁹

To sum up, Bekker's *Ondersoek* shares by and large the same characteristics as Graevius' *Oratio*. Ancient writings and narratives are viewed critically and set in their historical context where necessary. Both authors, particularly Bekker, undermine the biblical legitimation

²⁸² *Ibid.*, 28.

²⁸³ *Ibid.*, 55.

²⁸⁴ *Ibid.*, 18–19.

²⁸⁵ *Ibid.*, 31.

²⁸⁶ *Ibid.*, 3.

²⁸⁷ Ibid., 78.

²⁸⁸ Ibid., 97-98.

²⁸⁹ Bekker, De friesche godgeleerdheid, 691.

of the fear of comets. Precisely the same elements play a crucial role in Bekker's De betoverde weereld. In the eyes of orthodox contemporaries, Bekker's method here came dangerously close to that of Meijer and Spinoza, and the synod that removed the preacher in 1692 stated that 'the main difference bears on the authority and credibility of the holiest word of God'.290

In the light of this background, it is striking that the first edition of the Ondersoek caused little of a stir when it was first published, for the method of De betoverde weereld is already visible in a more than embryonic form. In 1682 Jacobus Koelman venomously condemned the attack on the fear of comets by 'some teachers', a term that Bekker felt applicable to himself too.²⁹¹ Three years later Henricus Brinck's attack on the philosophical innovators was also highly critical of 'Dr. Bekker' and other 'innovators' who claimed that comets did not have an ominous significance.²⁹² Brinck wrote explicitly that Bekker's position as a preacher was untenable since his views were in complete opposition to the orthodox doctrine of the Book of Nature as recorded in the second article of the Belgian Confession.²⁹³

Apart from this, however, there was little commotion, and ten years after publication Bekker was forced to admit that the Ondersoek remained unsold at the booksellers.²⁹⁴ It was reprinted in 1692 in connection with the stir caused by De betoverde weereld, and consequently included in the discussion of Bekker's unorthodox exegesis.²⁹⁵

'Expressions of God's glory'

While the positions regarding the status of the Holy Scripture in the field of natural philosophy rapidly polarised, there were also more balanced interpretations of comets. A good illustration of the opinions that were held in mid-field is offered by Constantijn Huygens who, in spite of his fascination with the new science, was by no means a radical. In 1676 he wrote a poem in which he paid respect to Descartes, Cocceius and Voetius in the same breath.²⁹⁶ Five years later he

²⁹⁰ Acten ofte handelingen van de noord-hollandsche synodus, 'Voorrede'.

²⁹¹ Chliarander, Vruchteloose Bid-dagen, 3. Cf. Bekker, Ondersoek, 72.

²⁹² Brinck, Toets-steen, 196.

²⁹³ Ibid., 203.

²⁹⁴ Bekker, Ondersoek, 'Aen den bescheiden Leeser'.

²⁹⁵ See, for example: Koelman, Het vergift, 9.

²⁹⁶ GCH VIII, 156-157.

composed the poem *Cometen-werck*, though it was first published only two centuries later.²⁹⁷ Huygens, an old man by now, had seen many such celestial signs, so that Christiaan asked him in 1681: 'I have never seen a comet of such strength, and you will be able to tell me whether it resembles the comet of 1618'.²⁹⁸ Like his sons, Constantijn Huygens was also irritated by all those who pestered him on the issue of the comet: 'They make my head steam with questions and repeated questions'.²⁹⁹ In spite of his irritation, however, it was a matter in which he himself also took a keen interest.

Huygens adopted the same point of view as Witsen and Graevius: comets are visible all over the world, and their tail points in all directions. Princes die everywhere, and that is 'as welcome for one as it is sad for another'. He then went into the two crucial issues in the debate on comets: their physical nature, and the question of whether the Bible contains anything on their meaning. He was clear enough on the first point: the nature of comets is a complete mystery, and it is therefore impossible to base specific predictions on 'incomprehensible matter and an extraordinary course'. Neither is the Bible clear on comets, but the Holy Scripture does state that only God knows what the future will bring, and that it is ungodly to fear the signs in the heavens—Huygens referred in the margin to *Romans* 11:34 and *Jeremiah* 10:2. 301 The idle art of soothsayers was thus condemned.

This does not mean that Huygens did not attribute any meaning to comets.³⁰² They may not be precursors of actual events, but they are signs of God's majesty, Huygens claimed. Like the other 'mighty wonders', comets are manifestations of God's creative almightiness:

My soul trembles, I am awed by sun and moon, So still, so regularly, so staidly do they move. 303

Mankind should not try to fathom God's work, but should regard comets as the proof of God's unlimited power.

²⁹⁷ GCH VIII, 259-262.

²⁹⁸ OOCH VIII, 312.

²⁹⁹ GCH VIII, 259.

³⁰⁰ Ihid

³⁰¹ Ibid., 260-261.

³⁰² *Ibid.*, 261.

³⁰³ Ibid., 262.

The emphasis on God's almightiness in his works, whether they were natural or extraordinary phenomena, was a constant fixture of the Christian tradition and was to receive a fresh impulse at the end of the seventeenth century.³⁰⁴ The mathematically very complex course of comets fitted perfectly into the rejuvenated image of God as the almighty architect. Disputes on whether or not the fear of comets had a basis in the Holy Scripture was replaced by eulogies in the spirit of Seneca. It was an advanced student of theology in Utrecht—of all places—who referred to the Stoa, Graevius and Bekker in 1728 in arguing that comets were expressions of God's glory.³⁰⁵

A good illustration of this tendency is also provided by the widely read Boekzaal van Europe (Reading room of Europe) by Petrus Rabus (1640–1702), which was first published in 1692. The editor of this periodical drew on contemporary developments in (natural) philosophy as one of the instruments to eradicate backwardness and superstition and to spread rationality and piety.³⁰⁶ Rabus himself was very interested in the study of nature. At the age of twenty, he had already explained in doggerel verse, Licht en duisternisse der Staartsterren (Light and darkness of the comets, 1680) that they were signs of God's majesty. The Lord used them

... for his government, honour, and might, who created all these phenomena for humanity.307

The tone of reviews in the Boekzaal was similar. It is characteristic, for instance, that the work of Van Leeuwenhoek, who was religiously indifferent, was transformed by Rabus into an attack on atheists.³⁰⁸ Rabus also devoted a great deal of attention to the works of Balthasar Bekker. 309 The very first issue of Boekzaal contained a review of the new edition of Bekker's Ondersoek. 310 Bekker, who was under heavy attack by now, was characterised by Rabus as 'a Christian teacher' who had

³⁰⁴ Bots, Tussen Descartes en Darwin; Vermij, Nieuwentijt.

³⁰⁵ Conynenberg, Dissertatio physica de cometis, 33.

³⁰⁶ De Vet, Rabus; Bots ed., Pieter Rabus en de Boekzaal van Europe.

³⁰⁷ Rabus, Licht en duisternisse der staartstarren.

³⁰⁸ Van der Saag, 'Rabus en Van Leeuwenhoek'.

³⁰⁹ De Vet, *Rabus*, 221–331.

³¹⁰ Boekzaal van Europe 1 (1692) 34-43.

rightly launched an attack on superstitious practice.³¹¹ He noted with approval that it was now proven that the interpretation of comets as heralds of the future is false. It was also patently clear that those who hold this belief are sinners. The fear of comets was born from 'our own lack of respect for God's most glorious works'.³¹²

The growing popularity of physico-theology would bring such views more emphatically to the foreground in the course of the eighteenth century. This was not yet the case in Nieuwentijt's well-known Regt gebruik (translated as The religious philosopher). The author apologised for leaving comets out of the discussion, 'as neither their cause nor their end are properly known to us'.313 It is a rather strange argument. Nieuwentijt, who favoured a strictly literal interpretation of the Bible, probably saw an exegetical problem looming up here.³¹⁴ Other physico-theologians were less reticent. Lambert ten Kate (1674–1731) claimed in his De Schepper en Zyn bestier te kennen in Zyne Schepselen (The Creator and His government known from His creatures) that the mathematically highly complex course followed by comets was an excellent demonstration of the 'wisdom and power of the Creator'. 315 The famous mathematician and comet hunter Nicolaas Struyck FRS (1686-1769) concluded that the appearance of comets was 'useful and necessary' because they 'must fill humankind with a deep respect and admiration for the creator and governor of the universe'.316

5. Concluding remarks

The seventeenth century saw a radical change in the way in which the appearance of comets was interpreted. At the beginning of the century they were generally regarded by Dutch scholars as signs of God's wrath and as possible harbingers of the Last Judgement. By the end of the century much had changed. While Voetian theologians continued to emphasise the traditional interpretation, a growing group of

³¹¹ *Ibid.*, 39.

³¹² *Ibid.*, 39–40.

³¹³ Nieuwentijt, Regt gebruik, 716.

³¹⁴ Cf. Vermij, Calvinist Copernicans, 352–358.

³¹⁵ Ten Kate, Den Schepper en Zyn bestier, 98.

³¹⁶ Struyck, Vervolg van de beschrijvinge der Staartsterren, 113. On Struyck see: Zuidervaart, 'Konstgenoten', 108–153.

scholars claimed that the appearance of comets should be regarded as a manifestation of God's majesty. The fear of comets came under increasing fire in the course of the century.

This change has often been causally linked with the rise of rationalism and the growth of knowledge in the field of the natural sciences. in casu astronomy. Closer inspection reveals three major obstacles to such a view. First, the change was a gradual one and cannot be related to a scientific breakthrough. On the one hand even the opponents of the fear of comets were in the dark regarding the physical nature of comets. On the other, Voetians like De Cocq were quite prepared to accept that comets were celestial bodies that obeyed natural laws. That only strengthened their conviction that biblical passages on stars and other celestial bodies were also applicable to comets. This brings us to the second point: the controversy was debated mainly on the basis of philological and exegetical arguments. It is significant that the protagonists of the two most extreme positions in the debate, Gisbertus Voetius and Balthasar Bekker, both appealed to the same biblical passages and, more generally, to the notion of the Book of Nature. Third, comets were and continued to be seen as divine signs, albeit of a different character.

The traditional interpretation of the supernatural significance of comets was based on a synthesis of certain biblical passages and classical texts. The appearance of a comet provided in the first instance material for hermeneutic and exegetical exercises. There was in fact a single, homogeneous discourse on comets until the first decades of the seventeenth century. Theologians, poets and natural philosophers still based their reflections on the extant corpus.

This interpretation of celestial signs came under increasingly heavy attack from the 1620s onwards, first of all by supporters of Pietism and the Further Reformation who recognised the Bible as the only key to the interpretation of natural phenomena, and thus qualified the astrological interpretation of comets contained in the extant Greek and Roman texts as heathen. Cats played a pioneering role here, and his position was elaborated in more detail by the influential figure of Voetius. A second, more or less parallel development can be seen among such humanists as Gerardus Vossius and Claude Saumaise, who did not completely reject the classical heritage as a homogeneous and essentially heathen whole, but pointed out internal inconsistencies in the corpus and the fact that the world of antiquity was fundamentally different in character from the world of their own day. While earlier classicists had identified with the views of their great examples on *prodigia* and *divinatio*, they now began to adopt a certain distance. In the short term the result of the efforts of the humanists and of the Voetian theologians was the same: the rejection of an astrological interpretation along Ptolemaic lines. This marked the completion of the first stage of the dismantling of the traditional interpretation of comets as having predictive value.

This lay at the heart of the debate on comets that reached a climax in 1665. The group of theologians and philosophers associated with the Utrecht professor Graevius now claimed that the interpretation of comets as omens was not only based on ancient pagan writings, but was not even supported by the Bible. Natural philosophical arguments played hardly any part in the dispute, in spite of the highly rhetorical references to the laws of nature. A text-critical analysis showed that there was no explicit mention of comets in the original text of the Bible, a fact that even proponents of an extremely literal interpretation of the text were reluctantly forced to accept. The exegetical approach reached its peak in Bekker's *Ondersoek* of 1683, which, when seen from this perspective, was less the start of a new era than the logical consequence of a process that had begun much earlier.

Foreign literature on the Enlightenment in general and on comets in particular has paid hardly any attention to the debate on comets that was conducted in the Netherlands, but it seems justifiable to claim that in this respect the Dutch Republic played a pioneering role within Europe.

The entire discussion in the Dutch context was thus in fact about the interpretation of the notion of the Book of Nature. The inadequacy of such notions as the disenchantment of the world or the struggle against superstition is clear. After all, who was not opposed to superstition? While the intellectual spectrum of the Voetians emphasised that God could be honoured best by reading the Book of Nature through biblical spectacles, a growing group of natural philosophers and theologians stressed that the best way of achieving that goal was to study the Book of Nature as an independent magnitude. The Creation was and remained a source of admiration, but this was no longer aroused by singular phenomena, but by the structure and purposiveness of the entire universe. Comets were thus transformed from ominous to glorious celestial signs.

The disappearance of prodigies from learned discourse was compensated by a growing interest in a new source of wonder: the mathematically highly complex course followed by comets, the geometric structure of snowflakes, and, above all, the microscopic world of insects.

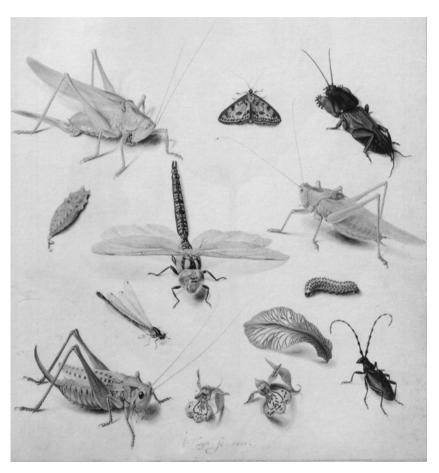


Fig. 25. Jacques de Gheyn II, *Insects and flowers* (1600), Lugt album fol 11/r, watercolour and goache on vellum, $22.7~\rm cm \times 17.5~cm$ (Fondation Custodia Paris).

CHAPTER FOUR

INSECTS: 'THE WONDERS OF GOD IN THE HUMBLEST CREATURES'

1. Introduction

On 30 March 1622 Constantijn Huvgens sent a begging letter from London to his parents in The Hague. He owed his friends 240 florins. He had not wasted the money, he hastened to add, but had spent it on important acquisitions: 'Drebbel's microscope (lunette) swallowed up forty of them'. This expense item was for the microscope that Cornelis Drebbel had constructed shortly before. Huygens was an eye-witness to the genesis of an instrument that would become one of the symbols of the new science of the seventeenth century.2 'Even if Drebbel had done nothing else his whole life long, he would undoubtedly have achieved immortal fame with this miraculous tube', Huygens wrote eight years later in the memoirs of his youth. 'It really is as if you stand before a new theatre of nature, or are on a different planet'. Huygens' friend Jacques de Gheyn II was equally astonished by what he could see through Drebbel's lunette. Huygens tried to get his artist friend to publish a collection of microscopic studies to give a new impulse to the rather diminished interest in the wonders of God's Creation. It is precisely in this New World of the microscopic that we are confronted with the dedication of the divine architect, Huygens rejoiced, 'and everywhere we shall encounter the same ineffable majesty'. 4 In the margin he referred to Aristotle's De partibus animalium:

Wherefore we must not betake ourselves to the consideration of the meaner animals with a bad grace, as though we were children; since in all natural things there is somewhat of the marvellous.⁵

¹ BCH I, 91.

² Wilson, *Invisible World*; Fournier, *Fabric of Life*; Ruestow, *Microscope*; Olivier, 'Binding the Book of Nature'.

³ Huygens, Mijn jeugd, 132.

⁴ *Ibid.*, 132–133.

⁵ *Ibid.*, 132–133; Aristotle, *De partibus animalium*, 645 a 15–17.

Huygens here refers to what the philosopher had written about the world of insects. De Gheyn was supposed to devote a book to these creatures, but the death of the artist in 1629 put an end to the project.⁶

Apart from a few exceptions, most traditional scholars ignored the world of insects. They regarded them on the whole as dirty and harmful, and suspected that they were the product of spontaneous generation, born not from sexual intercourse but from rotting organic waste. They were thus the lowest form of life in the Great Chain of Being, at the bottom of the hierarchy of humans, animals, plants and minerals. In spite of the calls of Aristotle and Pliny to pay more heed to their amazing anatomy, they were hardly regarded as a serious object of study down to the end of the sixteenth century. Some insects, such as ants, locusts and butterflies featured in biblical stories, fables and emblem books, but many other species received no attention at all.

A striking U-turn took place in the seventeenth century, particularly in the Dutch Republic. Several works appeared around 1700 describing and illustrating the most divergent sorts, varying from the traditional bee to the everyday cheese mite, and from exotic Surinamese butterflies to the Dutch water louse. Huygens followed these developments with eagle eyes. He was endlessly fascinated by the researches of two of Europe's most famous microscopists, Johannes Swammerdam and Antoni van Leeuwenhoek, who embarked on the systematic study of insects around 1670. Constantijn Huygens drew the attention of the Royal Society to the qualities of Van Leeuwenhoek and wrote a poem on Swammerdam's treatise on the mayfly, in which he praised the scientist's endeavours to show the large in the small.8 In the meantime insects were also increasingly seen as objects for collectors, and formed the category that appealed most to the imagination in the cabinets of naturalia of famous Dutch collectors such as Albertus Seba (1665-1736) and Levinus Vincent (1658-1727). The world of insects proved to be an endless source of astonishment. In his Het regt gebruik, Nieuwentijt asked the rhetorical question: Who could still doubt the existence of God after having examined an insect? Who will deny that 'a worm is created with wisdom' and that the Creator 'is no less to be admired in a mosquito, a fly, a flea, or a cheese mite than in

⁶ Huygens, Mijn jeugd, 132.

⁷ Lovejoy, Great Chain of Being, 236-240; Slaughter, Universal Languages and Scientific Taxonomy, 33-35.

⁸ BCH VI, 344; CHO X, 456–458; GCH VIII, 129.

the creation of the largest elephant'? Other eighteenth-century writers even created a subgenre within physico-theology—insecto-theology—of which the minister Jan Christiaan Sepp's *Beschouwing der wonderen Gods in de minstgeachtte schepzelen* (Consideration of the wonders of God in the humblest creatures, 1762–1860) is a well-known Dutch example.

The more general changing seventeenth-century conceptions of the wonders of nature are exemplified par excellence in the increasing interest in insects. 'Wonder', write Daston and Park,

was now displaced almost entirely to commonplace objects praised as marvels of divine handiwork. Late-seventeenth- and early-eighteenth-century entomology was particularly rich in such natural theological expressions of wonder at the ordinary. The Dutch naturalist Jan Swammerdam, for example, thought the humble ant deserved as much admiration as God's largest and gaudiest creations.¹⁰

This change is usually attributed to the rise of natural science. Due to the growing emphasis on underlying structures, which was partly the product of Cartesianism, from the 1660s scientists had recourse to the microscope, which had been around for decades. Thus Fournier writes:

Whereas prior to 1660 microscopic observations frequently appear to have been undertaken in order that scholars might marvel at the wondrous sight of hugely magnified crawling vermin, the nature of such investigations changed during the 1660s to the purposeful study of organic structure.¹¹

There was not just an instrument, but also a scientific framework on which its application depended, it is assumed. It is certain that developments in natural philosophy played an important role here, but this is only half the story. There was a manifest interest in insects long before the application of the microscope, and it was by no means a form of amusement. The appreciation of the smallest creatures was based first of all on biblical passages and the classical tradition. In other words, in the tradition of the Book of Nature, attention was also lavished on the small print.

⁹ Nieuwentijt, Regt gebruik, 560, 563.

¹⁰ Daston and Park, Wonders and the Order of Nature, 323. See also: Wilson, Invisible World, 185.

¹¹ Fournier, Fabric of Life, 30.

Classical conceptions of insects

Insects formed a category that was just as vague as the classical concept of comets. Aristotle wrote about *entomon*, later Roman writers about *insecta*; both words meaning to cut up or into. It included not only creatures that are nowadays regarded as insects, but also arthropods and some types of reptiles. The term *insecta* was often used as an umbrella category for small, wriggling creatures with an articulated structure and four or more legs. As a result of their complex generation, there was little notion of their different species and their respective developmental stages, and worms, caterpillars, maggots, larvae and pupae were easily confused with one another. The wide-ranging classical concept of *insecta* is taken as the starting point here.

Until late in the seventeenth century scholars fell back on what Aristotle and Pliny had written about these creatures. Aristotle had defined insects as 'those creatures which have incisions on their bodies, whether on their underside only, or both on their underside and on their backs'. 13 Their other characteristics included the presence of four or more legs, and the absence of blood. He never wrote a systematic study of insects; his observations and remarks are scattered over different works. A number of passages show that he had personally and meticulously investigated the anatomy and behaviour of bees, ants, beetles and other creatures, but he failed to draw a sharp distinction between the different developmental stages (egg, larva, pupa).¹⁴ He assumed that most insects were born by spontaneous generation.¹⁵ For instance, he wrote that the flea was the product of the filthiest kinds of dirt and that lice come from rotting flesh, though this was no obstacle to a positive appreciation of certain species. Irrespective of the nature of their generation (spontaneous or sexual), the world of bees, for example, constituted a stunningly harmonious society, ruled by what Aristotle regarded as a monarch.¹⁶

¹² For a general introduction see: Bodenheimer, *Geschichte der Entomologie*; Hagen, *Bibliotheca entomologica*.

¹³ Aristotle, *Historia animalium*, 487 a 32–33; 523 b 13–14; Idem, *De partibus animalium*, 682 b 5.

¹⁴ See for example: Aristotle, De partibus animalium, 682 a 10-683 b 4.

¹⁵ Aristotle, *Historia animalium*, 550 b–552 b. On spontaneous generation see: Lennox, 'Aristotle's Theory of Spontaneous Generation'; French, *Ancient Natural History*, 69–72; Smith ed., *Problem of Animal Generation*.

¹⁶ Aristotle, *Historia animalium*, 760 a.

For Pliny, nature was much more of a treasury of wonders than it had been for his more down-to-earth predecessor.¹⁷ Pliny devoted most of Book XI of his *Naturalis historia* to the 'creatures of immeasurably minute structure—in fact some authorities have stated that they do not breathe and also that they are actually devoid of blood'.¹⁸

He provided an extensive description of various species, such as, in the first place, the laudable bee, but he also went on to describe horseflies, silkworms, spiders, scorpions, mayflies and locusts. The latter were regarded by Pliny as sometimes sent by the gods as a sign of their wrath. He also assumed that most species were the product of spontaneous generation, but this did not lead to a negative judgement. The behaviour of the different species commanded respect, and people could learn from them. It was above all their complicated structure that provoked amazement. On the one hand Pliny seems to deny them an internal anatomy, on the other he explicitly describes how insects have minuscule feet, wings and other devices (*artificia*). But what an insight, what a power, what unfathomable perfection in such small, insignificant creatures!

Where did Nature find a place in a flea for all the senses?—and other smaller creatures can be mentioned,—but at what point in its surface did she place sight? where did she attach taste? where did she insert smell? and where did she implant that truculent and relatively very loud voice? With what subtlety she attached the wings, extended the legs that carry the feet, placed a ravenous hollow to serve as a stomach, kindled a greedy thirst for blood an especially human blood! ¹⁹

Already in the opening lines of Book XI, Pliny passionately argued that, while people are often filled with wonder by large elephants, bulls and lions, 'whereas really Nature is to be found in her entirety nowhere more than in her smallest creations' (*rerum natura nusquam magis quam in minimis tota sit*).²⁰ Practically every writer who wanted to interest his readers in insects cited this passage. The Plinian phrase, and Christian variations on it such as 'God is revealed in the smallest things' (*ex minimis patet ipse Deus*), were to become *topoi* in early modern discussions of nature.²¹ It would be no exaggeration to state

¹⁷ French, Ancient Natural History, 196-255; Beagon, Roman Nature.

¹⁸ Pliny, Naturalis historia XI, i.

¹⁹ Ibid. XI, i.

²⁰ Ibid.

²¹ Stebbins, Maxima in minimis.

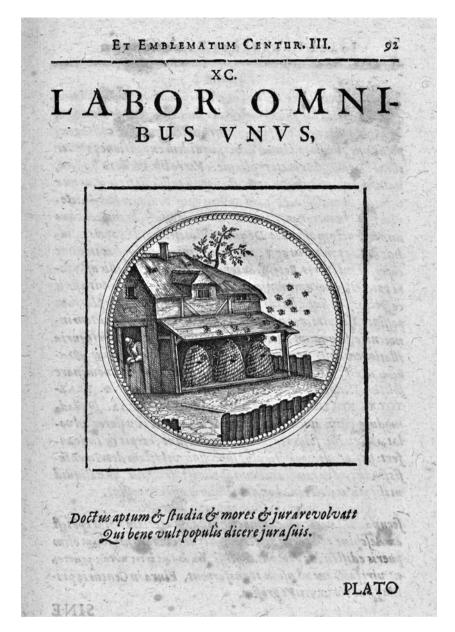


Fig. 26. According to a tradition that goes back to Antiquity, de beehive was considered a symbol of human society. As such, it was a popular topic in emblem books, such as Joachim Camerarius' *Symbola et emblemata* (1592) (KB).

that for centuries Pliny was the most cited authority when it came to insects. Besides the detailed descriptions of these creatures, he provided the intellectual justification for research on them.

The image of insects that was passed down from pagan antiquity was thus rather ambivalent. On the one hand they represented the lowest form of life, on the other their very existence was a manifestation of the creative force of nature. Accounts of the generation, anatomy and way of life of the incised creatures were accompanied by moralising remarks. Their minuscule structure seemed to point to a higher creative power. The world of the ant, the locust and the bee could teach many a moral lesson.

It was particularly the latter aspect that received a powerful stimulus from Christianity. Pliny was not the only one to write about the divine dimension of plagues of locusts; the book of *Exodus* had already told how Yahweh punished the Egyptians with plagues of mosquitoes, horseflies and locusts.²² The book of *Joel* also made mention of a plague of locusts, this time, accompanied by all kinds of celestial signs, as an announcement of the Day of the Lord.²³ The appearance of insects was not just an omen, however. The Bible taught that something of the almightiness of the Lord could be seen in every creature. As far as the lower forms of life were concerned, the Bible drew lessons from more than the lily of the field:

Go to the ant, thou sluggard; consider her ways, and be wise:

Which having no guide, overseer, or ruler,

Provideth her meat in the summer, and gathereth her food in the harvest. How long wilt thou sleep, O sluggard?²⁴

Other passages in the Bible indicated that lice, spiders and bees were also instruments of the Lord to encourage piety and respect.²⁵

The influence of the classical and biblical corpus on the appreciation of insects can hardly be overestimated. Only a very limited number of them—the bee, the ant, the butterfly—appeared in illuminated manuscripts and scholarly treatises, and they were regarded primarily

²² Exodus 8-10:21.

²³ Joel 1:2-2:11.

²⁴ *Proverbs* 6:6–9.

 $^{^{25}}$ See for example Exodus 8:16–18; Deuteronomy 1:44; Judges 14:9; Proverbs 30:24–27.

as symbols.²⁶ Until late in the early modern era, swarms of locusts, for example, were seen as divine retribution, or exegetes puzzled over what kind of subspecies John the Baptist had used to nourish himself in the wilderness.²⁷ For centuries the beehive was to be a metaphor of the ideal society, in which king, guards and workers each had a place of their own. The butterfly as a symbol of transience and the hope of resurrection was to become a popular theme in literature and art. In short, for centuries insects seem to have been noticed only in so far as they could be connected with classical and particularly biblical texts, as in the works of the Protestant theologians Danaeus and Franzius, who were widely read in the Dutch Republic.²⁸

Insects in early modern Europe

In the early modern era, natural history was mainly practised by scholars who, stimulated by a wealth of classical texts, religious and utilitarian motives and a mass of unprecedented material from the New World, tried to survey and describe the whole organic world of nature. Ambitious attempts to write a comprehensive *historia naturalis* were undertaken by such scholars as Conrad Gessner and Ulisse Aldrovandi.²⁹ The dozen voluminous folios in which these two scholars recorded their insights were the starting point for every researcher until late in the seventeenth century. Aldrovandi's *De animalibus insectis libri VI* saw the light of day in 1602, while Gessner's ruminations, supplemented by those of the English clergyman and botanist Thomas Penny (d. 1589) and his fellow Londoner Thomas Mouffet (1553–1604), were eventually published in 1634 as *Insectorum sive minimorum animalium theatrum*.

The encyclopaedic ambitions of Gessner and Aldrovandi implied that they gave an exhaustive survey of absolutely everything that had ever been written about every artefact or phenomenon. The fairly down-to-earth accounts of the external appearance of the components of the natural world were buried beneath a plethora of discussions of

²⁶ Gombrich, *Art and Illusion*, 68–69; Freeman, 'Illustrations of Insect Anatomy'; Lehman-Haupt, 'Microscope and the Book'; Ritterbush, 'Organism as Symbol'; Ogilvie, *Science of Describing*, 50–51; Vignau-Wilberg, 'Insektendarstellungen um 1600'.

²⁷ Matthew 3:4; Mark 1:6.

²⁸ Danaeus, *Physica Christiana*, 215–218; Franzius, *Historia animalium sacra*, 755–888.

²⁹ Gmelich-Nijboer, Conrad Gessner's 'Historia Animalium', Olmi, Ulisse Aldrovandi, Findlen, Possessing Nature, 17–31, 65–70 and passim.

etymology, biblical references, references to the classics, symbolism, sympathies and antipathies, etc. As Harms has written in a pioneering article: 'Compendia of natural history and emblem books with their combination of graphic and verbal elements, of description and interpretation, could at that time be considered to go hand in hand'.³⁰

What Gessner and Aldrovandi wrote about *insecta* is important in this connection. Here too observations of physical characteristics overlap with religious and other symbolism. For instance, Aldrovandi regretted the fact that many people overlooked these small creatures so thoughtlessly. The dedication of *De insectis* contains a Christian variant—the word nature has been replaced by God—of the Plinian *dictum* that the power of nature is sometimes more clearly revealed in small rather than large creatures.³¹ The work itself devotes enormous sections to the bee, the butterfly, the ant, the spider and the locust, but lesser-known beetles, silkworms, mosquitoes and lice are also incorporated in a dazzling system of references to such categories as *Historica*, *Denominata*, *Synonyma*, *Mystica*, *Moralia*, *Hieroglyphica*, *Emblemata*, *Proverbia*, *Fabulosa* and *Icones*.

That textual embedding is an essential characteristic of practically all of the important works on insects from the end of the sixteenth century, such as the *Symbola et emblemata ex volatibus et insectis* (1596) of Joachim Camerarius II (1534–1598) or the *Archetypa* (1592) of Joris Hoefnagel. These writers were in contact with one another and with scholars in the Netherlands. Camerarius, for example, was a close friend of Carolus Clusius and the physician and collector Bernardus Paludanus. He published the first of the four volumes of his *Symbola et emblemata* in 1590.³² Camerarius' book is in all respects a collection of emblems in the style of Alciati, except for being restricted to flora and fauna. For example, the bee in Volume III, which is devoted to 'flying animals and insects', is an emblem of industriousness and a sense of community.³³ Only a few species are covered: the locust, the spider, and unidentified insects that are attracted by candlelight, a

³⁰ Harms, 'Natural History and Emblematics', 67.

³¹ Aldrovandi, De animalibus insectis, 'Dedicatio'.

³² See the introduction by Harms and Kuechen to Camerarius, *Symbola et emblemata* II, 1*–41*; Harms, 'Natural History and Emblematics'; Tung, 'Impressa or Emblem Book?'.

³³ Camerarius, Symbola et emblemata II, 92.

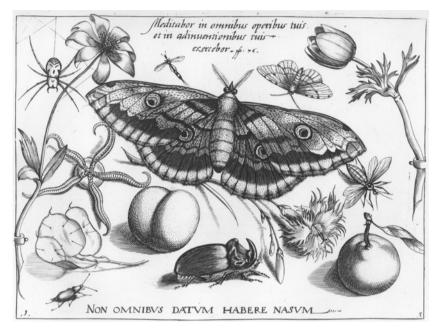


Fig. 27. Engraving taken from Joris Hoefnagel's *Archetypa* (1592), carrying a motto from *Psalm* 77: 12: 'I will meditate also of all thy work, and talk of thy doings'. Depicted are, among others, a peacock moth, a rhinoceros beetle and an ichneumon wasp (HAB).

warning against excessive curiosity. The *Symbola et emblemata* had a great influence on Dutch poets, particularly Jacob Cats.

Joris Hoefnagel, a native of Antwerp, who designated himself 'inventor hieroglyphicus et allegoricus', was the uncle of Constantijn Huygens, and his circle of friends included Camerarius and Clusius.³⁴ The erudite artist worked for a long time for Rudolf II and is a key figure in the North European tradition of the still life.³⁵ Around 1580 he produced an encyclopaedic collection of watercolours in which a large number of the fauna known at the time were illustrated by analogy with the four elements.³⁶ *Insecta* are grouped with the elements air and fire. The representations are so lifelike that at times they seem

³⁴ Evans, Rudolf II and His World, 97–98, 172; Bol, 'Goede onbekenden', 36–44; DaCosta Kaufmann, Mastery of Nature, 11–48; 79–99; Vignau-Wilberg, Archetypa, 7, 85

³⁵ Bergström, Dutch Still-Life Painting, 33-40.

³⁶ Hendrix and Vignau-Wilberg, Mira calligraphiae monumenta.

on the verge of flying off the parchment. Hoefnagel's ambitions, however, went much further than *ad vivum* representation, as can be seen from the *Archetypa*, a series of engravings published in 1592 in which plants, shells and insects are carefully grouped in compositions, each with a biblical or classical motto.³⁷

The *Archetypa* was the first printed work to contain realistic representations of insects. Hoefnagel's engravings are in sharp contrast to the relatively stylised illustrations of previous publications and show many more details than the woodcuts in Aldrovandi's *De insectis* which appeared ten years later. The question of what Hoefnagel illustrated is just as interesting as that of how he represented it. The *Archetypa* contains not only the canonical *insecta*, but also less familiar species such as beetles, cockroaches, harvest spiders, earwigs and such, which were similarly incorporated in a symbolic framework. Each engraving had a religious significance, with mottos such as 'narrabo omnia mirabilia tua Domine', taken from *Psalm* 9:1 ('I will praise thee, O Lord, with my whole heart; I will shew forth all thy marvellous works'), or 'praesentemque Deum quaelibet herba refert' ('And any blade of grass points to the presence of God').³⁸ The work concludes with the exclamation that the entire creation sings God's praise.³⁹

The *Archetypa* was influential in the Dutch Republic. The series was reprinted, and individual representations of insects were sometimes directly borrowed by other artists.⁴⁰ When Hoefnagel died in 1601, part of his work passed into the possession of the Huygens family. Jacques de Gheyn II saw it there and was prompted to illustrate insects himself.⁴¹ Hoefnagel's engravings were so true to life that even Johannes Swammerdam—a talented draughtsman who usually showed little appreciation of his predecessors—expressed his admiration for this 'very accurate' artist.⁴²

 $^{^{\}rm 37}$ I consulted the original in the HAB, Uh 4 14, and the edition by Vignau-Wilberg, Archetypa.

³⁸ Hoefnagel, Archetypa, Pars I, 5 and Pars III, 5.

³⁹ Hoefnagel, Archetypa, Pars IV, 12.

⁴⁰ Bergström, 'On Georg Hoefnagel's Manner of Working'.

⁴¹ Bergström, *Dutch Still-Life Painting*, 42–54; Van Regteren Altena, *De Gheyn* I, 66; Swann, *Art, Science, and Witchcraft*, 66–94.

⁴² Swammerdam, Bybel, 54.

2. The study of Insects in the Dutch Republic down to ca. 1660

The humanist tradition (I): insects as emblems

'My heart', wrote Jacob Cats in his *Buyten-leven* (Country Life, 1655) in connection with the busy bees, 'what do I learn here, what do I learn from this industrious creature'.

What sluggards we are in spirit, Compared with this hard-working animal!⁴³

Cats' lines are typical of the way in which insects were usually considered in the Dutch Republic down to the middle of the seventeenth century. Most species were regarded as 'a breed of evil worms, that come to storm the trees in the summer'.44 There was no question of any entomological interest. Only a few species—such as the bee, the ant, the butterfly and the spider—were noticed and featured in poems or paintings. This can be illustrated by the example of a group of scholars and artists who operated on the islands of Zeeland in Cats' day. Various scholars have drawn attention to this strong local tradition of studying detail in nature and drawing religious lessons from it.⁴⁵ This applied not just to *insecta*, but to small creatures in general. For instance, Adriaan van der Venne's eulogy of the Zeeland mussel is an unmistakable reference to the Book of Nature. 46 Another example is the minister and poet Petrus Hondius, who studied theology in Leiden around 1600, where he also developed a passion for natural history.47 His album amicorum includes entries by the great botanists Rembert Dodoens (Rembertus Dodonaeus, 1517-1585), Mathieu de L'Obel (Mathias Lobelius, 1538-1616) and Carolus Clusius. 48 In 1604 Hondius was called to Terneuzen, where he proved to be a keen botanist who owned dozens of plant species that were not even described in Dodonaeus' famous herbal, the Cruyt-Bouck. 49 Hondius settled on

⁴³ Cats, Alle de wercken II, 367. See also: Ibid., 358, 361-362.

⁴⁴ Ibid., 366.

 $^{^{\}rm 45}$ Meertens, Letterkundig leven, 441; Bol, 'Goede onbekenden'; Bakker ed., Masters of Middelburg.

⁴⁶ Van der Venne, Tafereel van sinne-mal, 98-99.

⁴⁷ Frederiks, 'Petrus Hondius'; Meertens, *Letterkundig leven*, 341–343; De Vries, *Wandeling en verhandeling*, 73–129.

⁴⁸ Meerkamp van Embden, 'Hondius'.

⁴⁹ See the 'By-voegsels' in the 1618- edition of Dodonaeus, *Cruyt-Bouck*, 216, 246, 264, 569.

the country estate 'Moufe-schans', where he gave instructions for the surrounding land to be converted into a botanical garden along the lines of that in Leiden, including a collection of curiosities. The botanising minister sang its praises in his poem Dapes inemptae, of de Moufe-schans of 1621. As Huygens would do thirty years later in his poem Hofwyck, Hondius emphasises that everything that can be seen in his garden serves to draw the attention of the visitor to the Creator: 'Who wishes to spend time with me here must honour God in his creatures'. 50 The poet provides an exhaustive description of the entire flora and fauna, but although insects must have been rife on the estate, Hondius does not mention a single one of them except the bee. There was an apiary in the grounds, and Hondius devotes pages to these useful, industrious creatures and their habits. The bee-hive, which they crafted to perfection, was an object of wonder as well as, in accordance with tradition, a metaphor for society in which the 'king', the 'guards' and the worker bees each had their place.⁵¹

Cats took the same view of insects. His emblem book Silenus Alcibiadis sive Proteus, later called Sinne- en minnebeelden, was published in 1618. This collection also dealt at length with the lessons that could be drawn from nature. For Cats, God's creation was an endless source of religious and emblematic representations. 52 The work thus presents a motley crowd of birds, lions, mice, tortoises, whales and other animals in an edifying combination of motto, illustration and poem. Insects play a role too. In emblem XL, 'Non intrandum, aut penetrandum' (Do not enter, or go right in), the spider's web is the starting point with a spider at the centre, surrounded by entangled bees, mosquitoes and wasps. Cats taught moral lessons—chastity, moderation, piety with a mass of borrowings from the classics, the Bible, the church fathers and contemporary emblematists. In the last emblem in the collection, number LII, a butterfly emerges from its cocoon with the motto 'Amor elegantiae pater' (Love is the father of elegance).53 Here too the insect is a potent symbol, standing for purity, the life-giving power of love, and the resurrection. Cats' sources in this case are the Bible, the classics, Camerarius and Hoefnagel.⁵⁴ Cats presented the

⁵⁰ Hondius, Moufe-schans, 530.

⁵¹ Ibid., 290-295.

⁵² Cats, Sinne- en minnebeelden I, 12.

⁵³ *Ibid.* I, 342–349.

⁵⁴ *Ibid.* II, 757-772.

same limited repertoire of insects and interpreted them in the same way in his later work.

The strength of the textual tradition can be gauged not only from the writings of various writers in Zeeland, but also from Gerardus Vossius' impressive De theologia gentili. Appealing to Pliny and the church fathers, Vossius devoted an interesting section of this work to God's humblest creatures.⁵⁵ Paradoxical as it may seem, this part of Vossius' book contained the most complete entomological compendium to be found in the Dutch Republic until around 1660, although there is no indication that the humanist studied the insects himself. This is hardly surprising; basing himself on all the relevant sources from Aristotle to Aldrovandi, Vossius presented a solid and balanced survey of what had been written on the subject over the centuries, and that was a considerable amount. Some species seemed to be born by spontaneous generation, others not. One sort had an internal anatomy, the other not. Some insects buzz, some hum, and some make no sound at all. The motion of insects is extremely interesting, and their brief lifespan is a cause for reflection. Both Pliny and the Holy Scripture mention that locusts are a plague sent by God.⁵⁶ Other, lesser-known species are reviewed: silkworms, mayflies, lice, and woodlice ('pissebedden', that is, bed-wetters, in Dutch) that are difficult to match in the classics.⁵⁷ Amid this teeming mass, there were three sorts that warranted particular attention: the bee, the ant, and the spider. They could serve as moral examples in every respect. Vossius thus refers to all the Christian and pagan passages as he devotes pages and pages to the society of bees, the industriousness of ants, and the traps of spiders.

Clutius senior and junior

By the middle of the seventeenth century there was thus considerable interest in insects, but hardly any attention was paid to studying their external characteristics, internal anatomy and method of propagation. There were no studies devoted solely to insects except for the important monograph that the superintendent of the botanical garden in Leiden, Dirck Outgaertsz Cluyt (Theodorus Clutius) published in 1597, Van de byen, hare wonderlicke oorsprone, natuer, eygenschap,

⁵⁵ Vossius, De theologia gentili, 1527-1647.

⁵⁶ *Ibid.*, 1621.

⁵⁷ *Ibid.*, 1565.

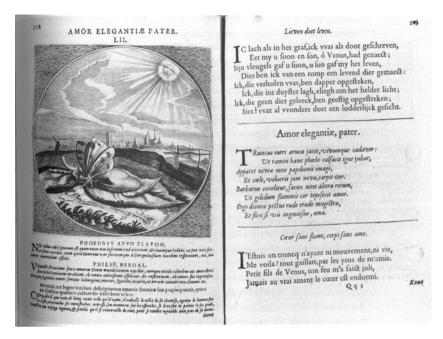


Fig. 28. Emblem from Jacob Cats' popular *Sinne- en minnebeelden* (1618), 'Amor elegantiae pater'. The metamorphosis of a caterpillar into a butterfly is represented as a symbol of the Resurrection, referring to *Revelation* 21: 5: 'Behold, I make all things new' (KB).

crachtige, *ongehoorde ende seldsame wercken* (On bees, their wondrous origin, nature, property, impressive, unprecedented and rare works). The work went through nine impressions in 110 years and rapidly became the *locus classicus* for anyone writing on bees. For example, Gerardus Vossius (a friend of Cluyt), Johannes Swammerdam and Antoni van Leeuwenhoek would later refer to it.⁵⁸

Much has been written on the origin of the botanical garden and on Cluyt's role in that process.⁵⁹ After failed attempts to get the physician of Enkhuizen, Bernardus Paludanus, to assume responsibility for the garden to be, it eventually proved possible to appoint the famous botanist Carolus Clusius to the post in 1592. By the time he arrived

Uffelen, 'Early History'. On Clutius: Bosman-Jelgersma, 'Dirck Outgaertsz Cluyt'; Eadem, 'Dirck Cluyt'.

⁵⁸ See for example: *Ibid.*, 1549; Swammerdam, *Bybel*, 370, 400; *ABL* XIII, 121–126.
⁵⁹ Fat and De Jong, *Authentic Garden*; De Jong, *Nature and Art*, 129–141; Van

in Leiden, however, he had fallen from his horse on the way and was too lame to be able to carry out his duties. At that point the curators decided to fall back on the Delft apothecary Cluyt in 1594.⁶⁰ Clusius was officially director of the garden, but Cluyt very enthusiastically took on the practical running of the *hortus*, namely laying it out and maintaining it.⁶¹ Cluyt contributed more than 4,000 simples from his own collection, and after a few months the botanical garden—a living herbal—could open its doors. Although the terms of Cluyt's appointment did not require him to teach, he often gave students guided tours of the garden.⁶² In the winter he taught them using dried specimens as well as 'six books of all kinds of herbs and flowers painted from life'.⁶³

This combination of word and observation is also characteristic of Cluyt's treatise on bees, which is couched in the form of a dialogue with his famous friend Carolus Clusius, whom he entertains for three days with discussions of bees in general and of their way of life in particular, as well as of the practical uses of honey and wax. With an explicit appeal to Pliny, Cluyt argues that bees are by far the noblest, most useful and most edifying of all insects, but he derives his knowledge not only from what he has 'read about them in the ancients and heard from others', but above all from his own experience. 64 Time and again he repeats that he has learnt from experience things unknown to the classics, and sometimes even in contradiction to what they had written. Following the scholarly conventions of his time, Cluyt opens with an etymological discussion. The Latin for bee is apis, which Cluyt fancifully connects with 'a-pedibus' 'because they come into the world without feet'.65 This is a clear example of the humanist notion that the essence of things is an integral part of their name.⁶⁶

Cluyt subscribed to the classical view that bees come into the world without feet, but he had serious reservations about the belief that they are born from the rotting corpses of cattle, although he by no means ruled out spontaneous generation. Experiment would probably demonstrate that all kinds of disgusting insects were born from dead cattle, but not the noble bee. As far as the latter was concerned, which

⁶⁰ Molhuysen, Bronnen I, 83, 294*.

⁶¹ Ibid. I, 317*-334*; Bosman-Jelgersma, 'Clusius en Clutius'.

⁶² Molhuysen, Bronnen I, 295*, 380*.

⁶³ Ibid. I, 380*. Cf. Egmond, 'Clusius, Cluyt, St Omer'.

⁶⁴ Cluyt, Van de byen, A2.

⁶⁵ Ibid., 2.

⁶⁶ Cf. Céard, 'De Babel à la Pentacôte'; Bono, Word of God, 26-79, 123-140.

was 'in everything like an upright person', Cluyt believed that it was born from a 'small white elongated seed' that the king deposited in each cell.⁶⁷

This was an interesting observation by Cluyt himself, which was very different from the conventional view. All the same, his ideas were clearly influenced by all kinds of a prioris. His theory of the generation of bees was based on the conviction that such noble creatures could not possibly be generated from anything as repulsive as rotting flesh. The special character of bees was revealed most clearly in their 'astonishing polity and government'. This was so remarkable 'that it seems to be a supernatural work'.68 Page after page, Cluyt explains to his discussion partner the wisdom of the king and the sense of community and self-sacrifice of the common bees. Disobedient worker bees were pitilessly killed by the others, but obedient bees had a strong sense of comradeship. Cluyt tells how he once found two bees, one almost drowned in a pot of honey, the other in a puddle of water. He took them both in his hand: 'The two bees, feeling the warmth of my hand, were revived and began (as friends are wont to do) to kiss and embrace one another'.69 Confronted with this example of love of one's neighbour, Clusius remarked: 'If only we Christians were as loyal to our God and ruler as these tiny birds are'. People, little birds: Cluyt transports the bees from the category of lower insecta to that of the higher forms of life.

It is interesting that Cluyt contrasts his own observations with what he regards as the erroneous accounts of the classics. At the same time he extensively cites such authorities as Aristotle, Pliny and Virgil to support the edifying example of bee society. The most salient feature, however, is the fact that Cluyt's account remains firmly within a biblical context. Scholars like Danaeus and Franzius had deployed their full erudition to determine the biblical flora and fauna, and Cluyt followed in the same direction.⁷¹ The Bible contains many references to honey.⁷² Cluyt therefore applied all his exegetical and natural historical

⁶⁷ Cluyt, Van de byen, 10-14.

⁶⁸ Ibid., A4.

⁶⁹ Ibid., 60.

⁷⁰ *Ibid.*, 16. This story was later included in Vossius, *De theologia gentili*, 1557.

⁷¹ Danaeus, *Physica Christiana*, 215–218; Franzius, *Historia animalium sacra*, 755–888.

⁷² See for example: *Genesis* 43:11; *Judges* 14:18; *Psalms* 19:11; *Proverbs* 24:13; 25:16.

knowledge to identify, for example, the type of honey on which John the Baptist had fed in the wilderness (*Matthew* 3:4; *Mark* 1:6).⁷³

As in Aldrovandi's *De insectis*, published five years later, which contained a long section on bees, description and symbolism went hand in hand for Cluyt as well.⁷⁴ The structure of the book, the inevitable eulogies and the conclusion clearly show the moral lesson that readers were expected to draw. Cluyt died soon after the publication of his book, in the spring of 1598. He lived to see the first two impressions, but died without knowing that it was to acquire a permanent place in the literature on natural history.

Cluyt's death was felt as a great blow in Leiden. Students submitted a petition to the curators asking for the vacancy to be filled by an 'experienced and knowledgeable young man', namely Cluyt's eldest son, Augerius Clutius (1578–1636).⁷⁵ The curators decided otherwise: Clutius was succeeded by Pieter Pauw. The rejection in no way affected the relations between Cluyt junior and Leiden University. He studied medicine there until 1601, after which he spent the years from 1602 to 1607 in Southern Europe and Africa, from where he sent Pauw all kinds of seeds and other rarities for the botanical garden.⁷⁶ From about 1608 Clutius worked as a physician and apothecary in Amsterdam. He had a professional interest in the medicinal effects of many *naturalia* and published several works on the subject, such as a two-volume work on a gigantic sort of coconut and the mayfly in 1634.⁷⁷

Interest in the mayfly, an insect belonging to the order Ephemeroptera, already went back to classical antiquity. These insects have larvae that live for years in the bottom of a river before swarming to the surface during a brief period in June and usually dying within a few hours. Until the appearance of Swammerdam's *Ephemeri vita* in 1675, their generation had been shrouded in mystery. Their brief lifespan, on the other hand, had been a metaphor for human existence in this earthly

⁷³ Cluyt, Van den Byen, 151-152.

⁷⁴ Cf. Aldrovandi, *De insectis*, 23–147.

 $^{^{75}}$ Molhuysen, Bronnen I, 380*–381*. On Clutius junior: Bosman-Jelgersma 'Cluyt'; Eadem, 'Augerius Clutius'.

 $^{^{76}}$ Molhuysen, *Bronnen* I, 435*–441*. Clutius also wrote an eulogy on Clusius in 1609, which was included in Clusius, *Curae posteriores*.

⁷⁷ Clutius, Memorie der vreemder blom-bollen; [Clutius], Tractatus de lapide Calsuve; Clutius, Opuscula duo singularia. I. De nuce medica. II. De hemerobio sive ephemero insecto. A facsimile of De hemerobio in: Francissen and Mol, Augerius Clutius.

⁷⁸ Francissen and Mol, Augerius Clutius; Francissen, 'Vroege Nederlandse bijdragen'.

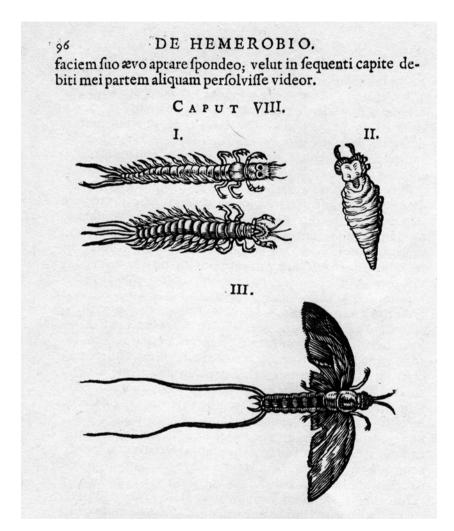


Fig. 29. Page from Augerius Clutius' *De hemerobio* (1634), including two rather clumsy illustrations of the may fly (figures i and ii) and one, far more lifelike, copied from Joris Hoefnagel's *Archetypa* (figure iii) (KB).

vale of tears ever since Cicero and Pliny.⁷⁹ Hoefnagel had already used the mayfly in his *Archetypa* as a symbol of transience, and Aldrovandi had likewise gone into its symbolism in his *De insectis*.⁸⁰

Clutius' book was the first publication to be devoted solely to this fascinating creature and, together with his father's Van den byen, was one of the first European monographs to be devoted to a specific species of insects. His curiosity was partly whetted by the supposed medicinal effects of the mayfly and the descriptions and illustrations that he had received from Joris Hoefnagel's son Jacob. In a way very reminiscent of his father, Clutius stated that he wanted to subject the older literature to the scrutiny of his own observations. After identifying Aristotle's ephemeron and Pliny's hemerobius with the Dutch mayfly, Clutius—entirely in accordance with the natural historical conventions of his time—also referred to several proverbs concerning the mayfly. 'As busy as a swarm of mayflies' was a Dutch proverb to indicate a dense throng of people, while in antiquity the premature death of someone provoked the comment 'Ephemeri vita'.81 Clutius refers to the classical sources and Aldrovandi, but devotes a particularly large number of pages to the observations of acquaintances and anonymous commoners (plebecula).82 The illustrations, partly based on Hoefnagel, were simple but not inaccurate. He also referred to the presence of ephemeri in the cabinets of curiosities of unnamed third parties. There is no indication that he had seen the insect alive, nor is there any evidence that he examined dead specimens with a microscope or magnifying glass.

Of course, Clutius gave ample coverage to the brief lifespan of these creatures. His remarks betray a strong Stoic influence. After having described the life-cycle of the mayfly, he added that it afforded an opportunity to admire the omniscient power of nature, which has condemned all creatures to one and the same fate, death. The most minute must be studied with care, 'especially because nowhere is the greatness of nature more manifest than in her smallest creatures, as Pliny writes'.⁸³ In other respects, however, Clutius' text is fairly down to earth, and he provided a good deal of material that later scholars,

⁷⁹ Cicero, *Tusculanae disputationes* I, xxxix; Pliny, *Naturalis Historia*, XI, xlii. Both sources are based on Aristotle, *Historia animalium*, 552 b 17–23; *De partibus animalium*, 682 a 27.

⁸⁰ Hoefnagel, Archetypa, Pars II, 10. See also: Aldrovandi, De insectis, 372-373.

⁸¹ Clutius, De hemerobio, 81-90.

⁸² *Ibid.*, 67.

⁸³ *Ibid.*, 87.

including Gerardus Vossius, Johannes de Mey and Johannes Swammerdam, would be able to elaborate.

Johannes Goedaert and Johannes de Mey

Dutch scientists thus had an interest in the world of insects, even though their gaze was focused on only a few species. More broadly conceived studies such as Mouffet's *Theatrum insectorum* (1634) were not published in the Dutch Republic until 1660, the publication year of the first of the three volumes of Johannes Goedaert's *Metamorphosis naturalis*, ofte historische beschrijvinge van...wormen, rupsen, maeden, vliegen, witjens, byen, motten en diergelijke dierkens meer (Natural metamorphosis, or historical description of...worms, caterpillars, maggots, flies, cabbage whites, bees, moths and other such creatures). Various Dutch editions of this extremely important and influential study appeared between 1660 and 1700, as well as translations into English (Johannes Godartius of Insects, 1682), French (1700) and Latin (1662–1669 and 1685). French (1850).

Goedaert (1617–1668) lived and worked in Middelburg his entire life. He operated in the same intellectual milieu as the poet Cats and the scholarly ministers Hondius and Lansbergen. He earned a living as a talented painter of still lifes, and was also active as an alchemist. His activities as an observer and describer of insects have received little scholarly attention. Goedaert probably never studied at a university. He was pious, well-versed in the Scriptures, and enjoyed a wide reputation for his lovable character (his Dutch surname means 'good nature'). He was a close friend of the preacher and natural philosopher Johannes de Mey, who was equally famous for his friendly nature. The latter played an important role in the composition and publication of Goedaert's work.

Metamorphosis, part of which was published posthumously, was the compilation of the results of years of research. Goedaert described a total of around 150 sorts, varying from bees to moths and from butterflies to flies. He had begun his observations around 1635. Like many, he was fascinated by their generation. For years he collected the insects in glass jars, observed their different stages every day, and experimented

⁸⁴ Goedaert, Metamorphosis naturalis, ofte historische beschrijvinge.

⁸⁵ Hagen, Bibliotheca entomologica I, 288–289; Kruseman, 'Éditions of Goedaert's Metamorphosis naturalis'.

⁸⁶ De la Ruë, Geletterd Zeeland, 61-63; Bol, 'Goede onbekenden', 30-35.

with changes in their diet and other living conditions. He wrote down what he observed in each creature and made sketches of their metamorphoses. Although he followed his own, largely anthropomorphic classification, it is fairly easy to identify the insects in question.⁸⁷ Goedaert was an ardent defender of the theory of spontaneous generation and went to work imaginatively in doing the illustrations—some of the pupae are rendered with unmistakeably human features! Later scientists, especially Swammerdam, did not fail to criticise or even make fun of Goedaert, but that criticism is not entirely justified, for Goedaert was the first in Europe to systematically study the generation of insects, and that pioneering work was inevitably not without its mistakes.

In the dedication to the first volume, Goedaert explained in detail why he had spent the greater part of his life on this uncommon activity:

In order that what had been neglected and unexplored in the past may come into the light to the glory of God and for the entertainment of all inquirers into nature, and show that none of God's creatures is to be despised, but that they are all disposed well and with ineffable wisdom 88

In a way somewhat reminiscent of Huygens senior, Goedaert states that people have had enough of the everyday wonders of nature, and that is why he now tackles a neglected theme. ⁸⁹ Goedaert acted according to both the spirit and the letter of *Proverbs* 6:6–9: he went not just to the ant, but to all creeping things, to draw lessons from them. His interest ranged farther than the insects mentioned in the Bible. Goedaert's work displays an interesting mixture of tradition and innovation, of textual orientation and independent observations. The subtitle of *Metamorphosis* ran: 'discovered, described and artfully illustrated not from several books, but only from personal experience'. This point was repeated throughout the work.

As in the case of Cluyt, however, the attacks on slavishly following the classics cannot hide the fact that the observations of the author were still largely dictated by the canon, namely biblical passages. A good illustration is the remark that insects are so attracted by candle-light that they are scorched by it. With a reference to 1 *Timothy* 6:16

⁸⁷ Snellen van Vollenhove, 'Determinatie der platen'; Bodenheimer, Entomologie II, 368–372.

⁸⁸ Goedaert, Metamorphosis I, 'Dedicatie'.

⁸⁹ Ibid. Cf. Huygens, Mijn jeugd, 132.

('Who only hath immortality, dwelling in the light which no man can approach unto'), Goedaert states that this is a warning for those who

are only too curious to investigate the divine secrets; for God lives in an unapproachable light, and we would be swallowed up by the radiance of his majesty long before we could discover his secrets and inscrutable perfections.⁹⁰

Here too we see a warning against excessive curiosity. The study of the Creation should in the first place serve a devote purpose. Knowledge and understanding of the natural world only come after that.

On the other hand, Goedaert was an innovator. His field of research included numerous creatures—flies, bumblebees, moths, wood lice—that had been traditionally neglected. In his colourful Dutch prose, Goedaert described how he searched in every corner of Zeeland, sometimes roaming over cemeteries by night with a candle to collect moths. He then put the different specimens in glass jars and kept them. He spared neither energy nor expense to study the generation of this highly diverse group of creatures. Goedaert even suggested that the study of bees would benefit from glass beehives.

It is noteworthy that Goedaert made little or no use of a magnifying glass or microscope. He was no exception in this respect. Although optical devices such as the single and composite microscope were known from the beginning of the seventeenth century, hardly any illustrated treatises on insects had appeared for which microscopes had been used before around 1660. The French physician Pierre Borel (ca. 1620–1671) had published a small book *Observationum microscopicarum centuria* in 1656 with very schematic illustrations and brief descriptions, but that was all until the publication of Robert Hooke's *Micrographia* in 1665.

If we turn to consider the results of Goedaert's fieldwork, the first is a powerful confirmation of the theory of spontaneous generation. Although he sometimes observed that certain sorts lay eggs, he was convinced that 'many small creatures, which are said to be created spontaneously, that is by themselves, are bred from rotting and warmth'. This form of generation had a deeper meaning. Goedaert was fascinated by the metamorphosis of caterpillars. He wrote that he

⁹⁰ Goedaert, Metamorphosis I, 18.

⁹¹ For two examples: Goedaert, Metamorphosis II, 101-102, 326.

⁹² Goedaert, Metamorphosis II, 136.



Fig. 30. Johannes Goedaert, A bouquet of roses in a glass vase. Also depicted are various insects, amongst others a bee, a butterfly, and a dragonfly. Oil on canvas, 50×37 cm, date unknown (Zeeuws Museum Middelburg).

had seen with his own eyes how two identical caterpillars died, and how different insects then emerged from their remains. A beautiful butterfly emerged from one, while a swarm of pests flew up from the other. It must have been a wonderful sight, although a reader today will be more likely to see in it the activities of an ichneumon wasp rather than the hand of God.

Goedaert interpreted the entire process of metamorphosis as the emergence of a form of life (caterpillar, worm), which then died, and from whose remains new life (fly, butterfly) arose by spontaneous generation. After a while the latter died too 'until a new generation'.93 Goedaert drew the traditional lesson that the process was a symbol of the resurrection of the dead. In the last resort the whole of nature was a source of edifying lessons and divine exhortations. Both in the dedication and in the work proper, Goedaert kept drawing parallels between biblical passages and his own observations, between the generation of insects and their symbolism. The life-cycle of the individual creatures not only offered moral instruction (admiration, a warning against excessive curiosity, hope of the resurrection), but also referred to the God-given order in nature.

Goedaert's unusual interest was to a large extent motivated by his religious convictions. He started his investigations in 1635 but, as he reported in 1660 in Volume I, it was only now that, at the instigation of others, he had decided to publish his findings.94 There are good reasons to take this phrase seriously, in spite of its seventeenth-century rhetorical conventionality. The pious painter seems to have been encouraged in various ways by the Middelburg preacher and natural philosopher Johannes de Mey. The latter was one of the many Dutch theologians who took an interest in the study of nature for religious reasons.95 He had published a Physiologia sacra in several volumes in the 1650s, in which he tried to identify the biblical flora and fauna. De Mey did not follow Voetian literal biblical exegesis, but was an eclectic who combined exegesis with the new natural philosophy. Insects played a large role in De Mey's biblical physiology. Referring to the Bible, Augustine, Pliny and Aldrovandi, he had explained in detail in 1655 that God's almightiness was nowhere more manifest than in

⁹³ Goedaert, Metamorphosis II, 140. See also: Goedaert, Metamorphosis I, 7-8.

⁹⁴ Goedaert, Metamorphosis I, 'Dedicatie'.

⁹⁵ On De Mey see: De la Ruë, *Geletterd Zeeland*, 96–116; Zuidervaart, 'Johannes de Mey'.

these small creatures.⁹⁶ Thus De Mey described the different types of locust that are mentioned in the Bible.⁹⁷

De Mey's hand is clearly visible in Goedaert's *Metamorphosis*. Goedaert emerges from the sources as a gifted observer, well versed in the Bible but otherwise not very familiar with the classical and contemporary scholarly literature. De Mey provided annotations for the first volume that not only referred to the relevant passages in Aristotle, Pliny, Pindar, Aesop, Seneca, Aldrovandi and Mouffet, but also went more deeply into such theological matters as divine providence and the resurrection. Moreover, De Mey wrote a brief appendix to this volume containing a summary and supplements to Clutius' *De hemerobio*. De Mey too was fascinated by the brief life of the mayfly.

After the death of Goedaert in 1668, De Mey took on the task of publishing his remaining notes as the third volume of *Metamorphosis*, adding 153 pages of his own to the 55 pages by Goedaert. De Mey commented on Goedaert's work, presented a survey of all of the *insecta* mentioned in the Bible (based on his *Sacra physiologia*), and emphasised once again that the great God himself is manifest in the smallest creatures.

De Mey did much more to familiarise the scholarly world with the work of his friend and fellow townsman. Together with his colleague Paulus Veezaerdt, he published a three-volume Latin translation of *Metamorphosis* that appeared more or less simultaneously with the original Dutch volumes.¹⁰⁰ De Mey adopted a broad definition of his task as editor and translator, providing the original work with supplementary material and commentary.¹⁰¹ His Latin version of Goedaert's researches is interesting for various reasons, first of which is the method. Goedaert, who lacked an academic background, had based his remarks primarily on his own observations and on the Holy Scripture. De Mey broadened this orientation in two different directions.

⁹⁶ De Mey, Physiologia sacra II, 244.

⁹⁷ Ibid., 138-139.

 $^{^{98}\,}$ Goedaert, Metamorphosis I, 'Aen de goedwillige leser'.

⁹⁹ 'By-voegshel des Geleerden D. Joannis de Mey' in: Goedaert, *Metamorphosis* I, (unpaged).

¹⁰⁰ Goedartius, Metamorphosis et historia naturalis insectorum...cum commentario D.H. de Mey; Goedartius, Metamorphosis et historia naturalis pars secunda de insectis...Latine donata a Paula Veezaerdt. See: Kruseman, 'Editions of Goedaert's Metamorphosis naturalis'.

¹⁰¹ Goedartius, Metamorphosis et historia naturalis insectorum I, 193-236.

On the one hand, the work was embedded in the classical and contemporary scholarly literature. On the other hand, unlike Goedaert, De Mey could see the importance of the microscope. 102 He fully shared the opinion formulated by Pliny and repeated by Borel that it was a wonder that the minuscule insects had 'eyes, feet, nerves and all kinds of other parts'. 103 In his own work too, the preacher wrote about the 'wondrous minuteness' of some creatures, whose 'limbs' and 'parts' could only be studied by means of a microscope. 104 It was thus thanks to De Mey that the work of the pious Goedaert was given a more scholarly presentation.

The second point follows from the previous one. Thanks to De Mey's efforts, Goedaert's work rapidly became known outside the circle of Dutch scholars and other interested individuals as well. Borel's work had helped to trigger a mild interest in insects; Goedaert's fairly systematic investigations now gave it a new impulse. Immediately after the publication of the first volume of *Metamorphosis*, Christiaan Huygens took a copy with him to Paris. The successive Latin translations were closely followed by the Royal Society. Goedaert himself received a visit in July 1663 from the French physician and royal adviser Balthasar de Monconys, who played an important role in the world of the Parisian Académies. The successive Latin translations are closely followed by the Royal Society.

The reception was not wholeheartedly positive in learned circles. Characteristic is the commentary of Martin Lister (1639–1712), a Fellow of the Royal Society, who was responsible for both the English and the second Latin translation. ¹⁰⁸ He considered that the work contained useful illustrations, but in other respects it was very inaccurate. Goedaert's investigations should have yielded more than a series of nicknames for insects: 'he seemes rather to have diverted with them, then to have given himselfe the trouble of well understanding them'. ¹⁰⁹ He was also highly critical of the first Latin translation. Lister therefore published heavily adapted editions not for real natural scientists but

¹⁰² Goedaert, Metamorphosis III, 88-91.

¹⁰³ Ibid., 89-90.

¹⁰⁴ De Mey, Al de Nederduitsche wercken, 457.

¹⁰⁵ OCCH XXII, 535, 544; OCCH IV, 214.

¹⁰⁶ CHO III, 476.

¹⁰⁷ De Monconys, Journal des Voyages II, 109-113.

¹⁰⁸ On Lister: Cook, 'Seventeenth Century Dutch and English Medicine'.

¹⁰⁹ Godartius, Of insects, A3/r. See also: Goderatius, De insectis in methodum redactum.

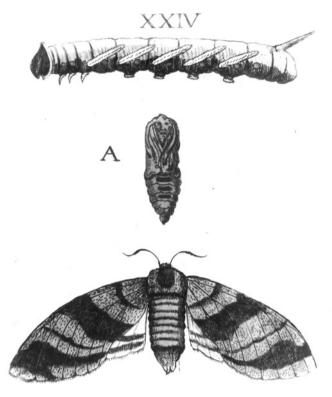


Fig. 31. Engraving of a caterpillar which, according to Johannes Goedaert's *Metamorphosis naturalis* was armoured with a poisonous sting. Note also the unmistakable human features of the nymph, a source for ridicule by Swammerdam (UBG).

'only for the curious'. This description of the readership of Goedaert's work is indicative. The content of *Metamorphosis* was called into question by scientists almost immediately after its publication by Francesco Redi in his *Esperienze intorno alla generazione degl'insetti* (1668) and by Swammerdam in his *Historia insectorum generalis* (1669), who both repudiated the theory of spontaneous generation.

Goedaert's work was nevertheless very popular among fellow artists, collectors and the group of *virtuosi* or *curieux*, and this is what accounts for its importance. *Metamorphosis* was accessible, entertaining, and attractively illustrated (in some exemplars the illustrations had been hand-coloured by the author). The work was very widely

¹¹⁰ Godartius, Of insects, A4/r.

distributed and was often translated and cited.¹¹¹ It was common in Dutch collections of books, but was also popular outside the Netherlands. Typically, it was commoner in eighteenth-century French libraries than the famous physico-theological works of Derham and Nieuwentijt. 112 Goedaert provided a particularly strong impulse for the study of other insects than the usual bees, ants and butterflies. His accessible books conveyed the same message as the works of Hoefnagel and Aldrovandi, but the contents and distribution of the latter raised their threshold much higher. Every insect, however insignificant, was a small miracle. People could draw moral lessons from the life of these 'humblest creatures', particularly from their miraculous generation. It is probably to a large extent due to Goedaert that the study and collecting of these creatures began to enjoy a rapidly growing popularity after 1660. Insects, which had been viewed ambivalently since time immemorial, were slowly but surely becoming acceptable in polite society.

The humanist tradition (II): insects under the magnifying glass

Goedaert made little or no use of the magnifying glass or microscope in his pioneering work. This perhaps remarkable neglect appears at first sight to be symptomatic of the general lack of interest of European researchers in an instrument that had been introduced half a century earlier.¹¹³ Admittedly, there were some steps in this direction, particularly in Italy.¹¹⁴ The Lynceans Federico Cesi and Francesco Stelluti published a small, microscopic study of the bee in 1625, but it had hardly any circulation.¹¹⁵ A few other scholars included incidental remarks on the microscope in more broadly orientated publications.¹¹⁶ To turn to the Dutch Republic, when Christiaan Huygens developed an interest in the microscope around 1665, he observed insects, though did little with his observations.¹¹⁷ Johannes Hudde (1628–1704), a brilliant mathematician who later became mayor of

¹¹¹ Van der Waals, 'Met boek en plaat', 228.

¹¹² Mornet, Les sciences de la nature en France, 9, 248.

¹¹³ Wilson, *Invisible World*, 70–12; Ruestow, *The Microscope*, 38; Fournier, *Fabric of Life*, passim.

Fournier, Fabric of Life, 1–48 and 201–202 ('Appendix A. Books on microscopy published between 1625 and 1750').

¹¹⁵ Cesi and Stelluti, Apiarium; Freedberg, Eye of the Lynx, 151-194.

Odierna, L'occhio della mosca; Fontana, Novae coelestium, terrestriumque rerum observationes; Kircher, Ars magna lucis et umbrae in decem libros digesta.
OCCH I, 321.

Amsterdam, was fascinated by optics. In 1657 he toyed with the idea of studying the process of generation 'through magnifying glasses', but as far as we know he never put his idea into practice. 118 With the exception of Borel's relatively crude Observationum microscopicarum centuria, published in The Hague in 1656, natural scientists published no microscopic studies of the bloodless creatures. Borel's work, which was carried out with a microscope that only magnified to a small extent, includes rudimentary woodcuts of bees, flies and other insects in addition to the descriptive texts. 119 In the large literature on the history of the microscope, it is the publication of Robert Hooke's Micrographia in 1665 that is usually regarded as the mile-stone. This was 'the book that popularized the microscope', as Wilson put it. 120 It certainly did make a big impression all over Europe and contributed to a large extent to making this instrument popular, particularly by means of the splendid engravings. 121 'Good figures, Flea and louse the size of a cat', wrote Christiaan Huygens to Hudde. 122 It was the publication of *Micrographia*, it is argued, that made microscopy a serious scientific activity. The attempt by historians of science to explain the apparent lack of interest in the microscope between 1620 and 1665 can be regarded as theorising the gap. Two factors are usually adduced in this connection: the fact that lenses were fairly primitive down to around 1665; and, above all, the lack of a natural scientific research programme. It was only with the emergence of Cartesianism, with its great emphasis on minuscule particles, that scientists were to make systematic use of the microscope. 123

However, questions can be raised regarding both the supposed problem and the explanation. The instrument was in fact not neglected in the first decades after its invention to the extent that is usually assumed. Dutch scientists displayed a lively interest in the new instrument before the publication of *Micrographia*, as is shown by the comments that Huygens made around 1630 in his memoirs of his

¹¹⁸ UBA Ms D 29, fol. 1/r–2/v. On Hudde: Vermij and Atzema, 'Specilla circularia: an Unknown Work by Johannes Hudde'; Vermij, 'Bijdrage tot de bio-bibliografie'.

¹¹⁹ Chabbert, 'Pierre Borel (1620?-1671)'.

¹²⁰ Wilson, Invisible World, 75, 86.

¹²¹ Harwood, 'Rhetoric and Graphic in *Micrographia*'; Bennett, 'Instruments and Ingenuity'.

¹²² OĆCH V, 305.

¹²³ Ruestow, *The Microscope*, 39 and passim.

¹²⁴ Jorink, "These wonderfull glasses".

possunt, Microscopio facile animadvertuntur, & sic avelli possunt vulnera etiam invisibilia quorundam serpentum, vel ab acubus missilibus inslica, stilisque: sic non visum effugient, sicque dilatato vulnere poterunt ad curam remedia propria admoveri.

OBSERVATIO LV. De Erucis.

IN Erucis aliisque Insectorum variorum villi & colores egregiores, quam in zibellinis acholosericis vestibus erminis visuntur, & in eis multi colores ac maculæ, oculos nostros effugientes, distinctissime animadvertuntur.

OBSERVATIO LVI. De Papilionibus.

PEnnæ in Papilionibus serici aliisque quibusdam ramosæ apparentes, unico cum ordine 32. villorum Microscopio duplices apparent, & 64. numerantur, folium filicis imitantur, rursusque villi pen-



nam integram imitantur aliquo pacto novà villorum ex unoquoque productione.

In quibusdam verò

OB-

triplex est series villorum, in aliis unica, ut in muscilionibus quibusdam,

Fig. 32. Page from Pierre Borel, *Observationum microscopicarum* (1656), including a crude woodcut representing a moth (KB).

youth, or De Mey's repeated eulogies, for instance. If this interest has been noticed at all, in the most favourable case it has been characterised as a form of entertainment: 'the characteristic incentive had remained the delight of wonder'. 125

If we take the crucial concept of wonder as our starting point, it is striking that not only Huygens and De Mey, but also other scientists and dilettanti such as Jacob Westerbaen, Andreas Colvius and Isaac Vossius regularly made use of the microscope or magnifying glass between 1620 and 1665 to study the world of insects. They did so with relatively refined devices, and in some cases publications bear witness to the results of these activities. This was evidently an important local tradition. If the activities of these humanists may appear marginal from the point of view of the scientific revolution, they are fascinating when considered in terms of the idea of the Book of Nature. Paradoxically or not, scholars who were closely tied to the textual tradition seem to have resorted to the use of the microscope before the mathematicians and Cartesians did. This hermeneutically biased view of nature can be distinguished from an attitude primarily directed to recording facts and describing internal and external structures. The work of these Dutch researchers was a systematic programme, albeit one directed towards observation and contemplation rather than dissection and analysis.

Huygens' fascination with the microscope is well known. 'If De Gheyn senior had lived longer', Constantijn remarked around 1630,

he would probably have devoted himself to rendering the very tiniest objects and insects with a very fine brush. I had already made efforts to drive him in that direction, and he was certainly not averse to the idea. 126

Huygens immediately realised the opportunity to give a new impulse to the rather diminished interest in the wonders of nature by means of this new instrument. 'Therefore nothing will impel us more strongly to venerate the infinite wisdom and might of the Creator than entering this new treasury of nature', he wrote. Huygens himself put part of this programme into practice. In his poem *Daghwerck* (1638), for instance, he wrote that he could now draw lessons from the study of

¹²⁵ Ruestow, *The Microscope*, 5, 39. In the same spirit: Fournier, *Fabric of Life*, 30. ¹²⁶ Huygens, *Mijn jeugd*, 132. See also: Van Regteren Altena, *De Gheyn*, 136–138; Alpers, *Art of Describing*, 1–25.

Huygens, Mijn jeugd, 132-133.

flowers, mosquitoes and ants thanks to the invention of the microscope. ¹²⁸ In a lively correspondence with Margaret Cavendish (1623–1673) he sang the praises of 'these wonderfull glasses'. ¹²⁹ He was by no means the only one to do so.

An interesting figure in this connection is Jacob Westerbaen (1599-1670), a physician, Remonstrant and friend of Cats and Huygens. 130 Like Huygens, with whom he enjoyed a particularly good contact, Westerbaen constructed a country estate just outside The Hague, which he eulogised in his Ockenburgh of 1654. That poem contains a long and particularly striking passage on the very smallest creatures. It is no surprise to find the community of bees, the beauty of butterflies and the industriousness of ants again. Unlike such poets as Cats, however, Westerbaen pays hardly any attention to symbolism, but concentrates on the external appearance of insects, following the course suggested by Huygens. With a reference to Pliny, he writes that God is more manifest in the 'creature' of a mosquito than of an elephant: 'nature here shows her art in which wonders lie hidden'. 131 The Creator displays himself in the beautiful colours of butterflies, and even in the structure of an ants' nest. This appreciation of insects will have been increased to a large extent by the fact that Westerbaen owned a magnifying glass. He devoted page after page to the wonders that he observed with the aid of this instrument. For instance, he gave detailed descriptions in rhyme of the less familiar insects, such as cheese mites, fleas and lice:

I see through the crystal that makes them great, A fearful ant, a flea with hairy feet.¹³²

Westerbaen must have studied these insects intensively and at length. He did so more than six years before the publication of the first volume of Goedaert's *Metamorphosis*. He even speculated on the digestive systems of these creatures.

Against the background of the conventional views on spontaneous generation, his comments on the sexual organs of insects are particularly interesting. Referring to Pliny on the marvellously refined senses

¹²⁸ GCH III, 80-81.

¹²⁹ BCH V, 284.

¹³⁰ Worp, 'Jacob Westerbaen'.

¹³¹ Westerbaen, Ockenburgh, 141.

¹³² *Ibid*.

of even the most minute louse, Westerbaen wrote about the noses, tongues and stings of all kinds of insects. He also wondered where their brain was located, and who would describe the male and female sexual organs:

Who shows me in this folk throat, stomach and bowels, Where it takes in food and the waste expels? Who has seen its heart, on which all life does depend, Who its brain, seat of feeling and sentiment? Who the male or female organ, in which resides The urge to generate, and to play or ride?¹³³

The reader gains the strong impression that Westerbaen has made active use of his instrument—and all this two years before the publication of Borel's work and eleven before that of Hooke. The latter were illustrated treatises with a very different character from Westerbaen's didactic poem, of course, but *Ockenburgh* remains one of the first published descriptions of microscopic observations of insects in European history.¹³⁴

Westerbaen probably went to work in his close observations of a variety of insects with the *Naturalis Historia* in one hand and a magnifying glass or microscope in the other. With his own eyes he saw confirmation of the Plinian *dictum* that nature is never manifested more grandly than in the smallest things. It is unlikely that he engaged in protracted research as Goedaert did at the same time, or dissections like those that Swammerdam was to undertake some fifteen years later. His activity as a microscopist will have been more likely to have been born from wonder at these, the smallest letters in the Book of Nature, than from an urge to thoroughly investigate nature.

It is unclear precisely what instrument the author had at his disposal. In the poem it is vaguely described as a magnifying glass, crystal, and glass. Other sources offer no aid. Perhaps Westerbaen made use of one of Drebbel's composite microscopes, for instance through the mediation of Constantijn Huygens. However that may be, his poem shows that a classical orientation and a systematic use of the microscope could proceed hand in hand.

Westerbaen was certainly no exception. Another friend of Constantijn Huygens, Andreas Colvius (1594–1627), was equally fascinated by

¹³³ Ibid., 143.

¹³⁴ Cf. Fournier, *Fabric of Life*, 201–202 ('Appendix A. Books on microscopy published between 1625 and 1750').

the microscope. It worthwhile to spend a little more time on Colvius because he is an interesting but little-known exponent of the group of theologians who devoted themselves to the study of nature for religious motives. He has been described in the scanty publications about him as one of the most learned men of his day.¹³⁵ After studying theology in Leiden, Colvius was minister of the Dutch delegation in Venice from 1622 to 1627, after which he was called to the Walloon church in Dordrecht. Colvius had a very lively interest in science in the widest sense of the word. He owned unpublished works by Descartes and Galileo, as well as a cabinet of curiosities.¹³⁶

Colvius was a cousin of the most influential statesman in the Netherlands, Johan de Witt (1625-1672) and was a close friend of Descartes, Isaac Beeckman, Huygens senior and junior, and Vossius senior and junior. Unlike his well-known friends, however, Colvius published virtually nothing. His comments in letters and autobiographical writings on the Book of Nature in general and the world of insects in particular are illuminating for a grasp of the intellectual world in which he operated. He moved in the common domain of theologians, humanists and philosophers of nature. Characteristic of his attitude is the fact that he deeply regretted the conflict between Descartes and Voetius and tried to play a conciliatory role. Descartes sent him a copy of his attack on Voetius, the Epistola ad celeberrimum virum D. Gisbertum Voetium. 137 Colvius' reply is tantamount to his credo. 'I have received and read your apologetic text with regret', he begins, before proceeding to explain that the philosophy of nature and theology cannot be separated from one another, but are complementary. 138 In line with Reformed orthodoxy, Colvius states that humankind 'learns to know God's almightiness, wisdom and goodness from the Book of Nature, and his truth, justice and mercy from the Holy Scripture'. The fact that both Descartes and Voetius took their respective positions to extremes only harmed religion.

In Colvius' view, Christians can make an important contribution to combating atheism by studying the Book of Nature. He impressed that strongly on Descartes and emphasised the same point in his correspondence with his mentor Gerardus Vossius. At such a time, Colvius

¹³⁵ NNBW I, 627–629; Thijssen-Schoute, 'Andreas Colvius'; Van Berkel, *Beeckman*, 112–114.

¹³⁶ See Chapter Five.

¹³⁷ AT III, 646-647.

¹³⁸ AT III, 680–682.

wrote to Vossius in 1642, in which the Bible was read by so few and in which philosophers made discoveries that had been unknown to antiquity, it was necessary to turn to the study of nature, though with the proviso that natural inquiry alone does not lead to piety. In fact, if heathen philosophers tried to explain the course of nature, this was bound to lead to diabolical knowledge (sapientia diabolica). 139 Only when belief and natural inquiry proceeded hand in hand could man rise via the creatures to God. This was why he had already spent so many years studying physics and astronomy, partly to illustrate his sermons on *Psalm* 104. We know from other sources that these claims were substantiated: the minister possessed the latest astronomical literature, carried out observations with the telescope with Isaac Beeckman, recorded the position of the celestial bodies, delved into the discussion of Copernicanism, and observed the solar eclipse of 21 August 1645. 140 In 1659, when Christiaan Huygens was one of the most celebrated scientists in Europe because of his discovery of the ring around Saturn, Colvius emphatically reminded him of the religious dimension of his research with the telescope, although it is doubtful whether these words made much of an impression on Christiaan given his total religious indifference.¹⁴¹ At any rate, it is clear that, like his colleagues Hondius, Lansbergen and De Mey, Colvius took the doctrine of God's two books as formulated in the Belgian Confession very seriously.

Colvius' interest in God's wondrous works extended beyond astronomy. He was also very interested in human anatomy, as well as in natural history, microscopy and the world of insects. His well-stocked library included not only work by De Mey and of course Pliny, Gessner and Aldrovandi, but also Mouffet's *De insectis* and Clutius' *De hemerobio*.¹⁴² He was introduced to the microscope around 1639 by Constantijn Huygens.¹⁴³ He received a brand-new exemplar 'from our workshop', as Huygens senior proudly mentioned, in 1655.¹⁴⁴ It had been produced by Christiaan and was intended as a token of gratitude for Colvius' role as mediator between the Dordrecht maker of

¹³⁹ BLO, Ms Rawls. lett. 84 (b) fol. 185.

¹⁴⁰ Beekman, *Journal* IV, 263; UBL, BPL 284, 'Adversaria', fol. 6-7, fol. 29-34; *AT* III, 646-647.

¹⁴¹ OCCH II, 475.

¹⁴² Catalogus rarissimorum...librorum...D. Andreae Colvii.

¹⁴³ BCH I, 449–450.

 $^{^{144}\,}$ BCH V, 228–230. Cf.: Fournier, 'Huygens' Designs'; Van Helden and Van Gent, 'Lens Production'.

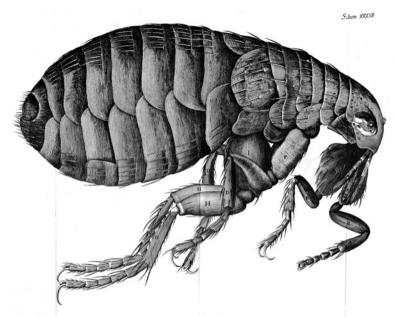


Fig. 33. The publication of Robert Hooke's *Micrographia* (1665) made a deep impression, also among Dutch scientist. 'Good figures', Christiaan Huygens noted with a sense of understatement (UBL).

instruments Calthoff and the Huygens family. Colvius was delighted to receive a microscope from the hands of the young physicist and inventor, and it must have been a high-quality instrument.¹⁴⁵ Colvius was bitten by microscopy. In the following year he received a copy of Borel's *Observationum microscopicarum centuria* and began to examine insects himself through the lens of his microscope.¹⁴⁶ He also collected and kept them in his cabinet of curiosities.

This fact speaks volumes. Philosophers of nature, theologians and virtuosi began to take the time-hallowed adage that God also manifested his greatness in insects more seriously. There are hardly any traces in the sources of the presence of insects in collections of curiosities before around 1660. In 1663 the British botanist John Ray noted the presence of 'a locust of the sort that St John Baptist ate in the wilderness' in a cabinet in Delft, but that was an exception. 147 Otherwise

¹⁴⁵ BCH V, 240.

¹⁴⁶ OCCH I, 321.

¹⁴⁷ Ray, Observations, 25.

there were initially no insects in collections of that kind. It was probably partly as a result of Goedaert's work that the situation changed rapidly. Visitors to Dutch collections increasingly came to mention spiders, butterflies and centipedes. They too were now regarded as a means of provoking wonder at God's greatness. Colvius is illustrative of this process. As he noted in his *adversaria*: 'God's greatness is manifest in the smallest things. See Aristotle and Pliny. They are a means for us to rise to God'. 149

The supposed religious message of the words of the classics seemed to be underlined by the new instrument and the new object of study, but on the other hand, it raised questions regarding the *sapientia veterum*. Pliny was right, Colvius wrote to Christiaan Huygens, nature is nowhere greater than in what is small, but which of the ancient philosophers had penetrated further into the secrets of nature than the scientists of our century?¹⁵⁰

Colvius was not the only one to raise these questions. His very learned friend Isaac Vossius did the same. He too had a lively interest in the microscope and in insects. With the same amazing combination of erudition and recklessness with which he had conducted biblical criticism, he plunged into optics in the 1660s. He held discussions about telescopes and microscopes with such experts as Christiaan Huygens and Hudde. Balthasar de Monconys, who went to see Vossius after paying a visit to Goedaert in 1663, was welcomed with a simple microscope, presumably produced by Hudde. According to the correspondence of Oldenburg, Vossius, who had been a Fellow of the Royal Society since 1664, wrote 'a little Latin treatise on glass drops' in 1668, but there is unfortunately no trace of it today. Iss

Vossius was also interested in insects and sent Melchisédec Thévenot a copy of Goedaert's *Metamorphosis*. ¹⁵⁴ When the self-proclaimed oracle was in England in 1666, the curious Colvius begged him to try to find a particular book on insects, probably Hooke's *Micrographia*, a work

¹⁴⁸ See for example: De Monconys, *Journal des Voyages* II, 111–112, 171; HAB Extrav. 253.1, 'Itinerarium' Christian Knorr von Rosenroth, fol. 166/v.

¹⁴⁹ UBL, BPL 284, 'Adversaria', 284, fol. 89/r.

¹⁵⁰ OCCH I, 322-323.

¹⁵¹ OCCH III, 364; OCCH V, 393–395; Dijksterhuis, 'Development of Isaac Vossius' Opticks'.

¹⁵² De Monconys, Journal des Voyages II, 153.

¹⁵³ CHO V, 180.

¹⁵⁴ OCCH V, 18.

that Vossius held in high esteem.¹⁵⁵ The Florentine scholar Lorenzo Magalotti (1637–1713), secretary of the Accademia del Cimento, visited Vossius in 1667 and subsequently wrote to Francesco Redi that Vossius was eagerly awaiting the publication of Redi's work on insects, the impressive *Esperienze intorno alla generazione degl'insetti* (1668).¹⁵⁶ In short, even a philologist with a European reputation like Vossius was fascinated by the world of the minuscule. Partly thanks to the new optical inventions, he came to the conclusion that the classical tradition was insufficient. The pioneer of radical biblical criticism concluded that 'we live in a century in which the senses of fools could perceive more than all of the wise Greeks put together'.¹⁵⁷ The world of the ancient texts was not unproblematic, and was by no means fully compatible with contemporary observations.

3. Swammerdam and the transformation of the Book of Nature

'With surprise' Johannes Swammerdam concluded in 1669 that he had solved a puzzle which for two thousand years, 'counting from Aristotle, has had people blindly groping and fishing in the dark; and not only those of little understanding, but even the keenest of intellects'. 158 These were the words of a self-confident man. They come from Swammerdam's pioneering Historia insectorum generalis ofte algemeene verhandeling van de bloedeloose dierkens (General history of insects or general treatment of the bloodless creatures), published in November 1669. This work appeared in the same year as the posthumously published third volume of Goedaert's Metamorphosis, but Swammerdam's argument was of a very different kind. While the pious Goedaert, like almost all other scholars before him, had defended the theory of spontaneous generation, Swammerdam claimed that even the tiniest of creatures were the result of sexual procreation. It is unclear why the learned Swammerdam chose to publish his work in Dutch instead of Latin. Perhaps this was connected with the popularity of Goedaert. At any rate, it is clear that Swammerdam's book was explicitly intended

¹⁵⁵ BLO, Ms d'Orville, 470 fol. 79. Vossius was on friendly terms with Hooke, see: *OCCH* V, 482–483; *Diary of Robert Hooke*, 151, 152, 353–357; Vossius, *De Nili origine*, 114.

¹⁵⁶ BMLF, Fondo Redi, 206 fols 55/r-56/v.

¹⁵⁷ Vossius, De Nili origine, 102.

¹⁵⁸ Swammerdam, Historia, 'Naa-reeden', 10.

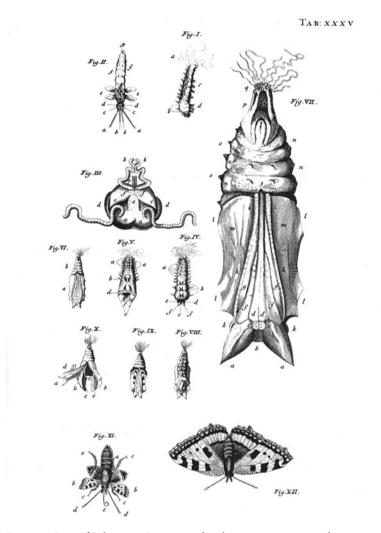


Fig. 34. One of Johannes Swammerdam's most important observations: parts of the future butterfly were already discernable in the caterpillar (KB).

as an attack on Goedaert. He wrote that Goedaert had studied more caterpillars than all the scholars of the previous centuries put together, but he had made such gross errors as to render his work actually worthless.¹⁵⁹

Swammerdam's *Historia* appeared more or less simultaneously not only with the last volume of Metamorphosis, but also with two revolutionary books written by Italian scientists: Francesco Redi's Esperienze intorno alla generazione degl'insetti, mentioned above, and Marcello Malpighi's Dissertatio epistolica de bombyce, a work on the dissection of the silkworm larva. 160 Both books called into question views of the anatomy and generation of insects that had prevailed for centuries. Swammerdam's study, however, was completed independently of the two Italians and was far more revolutionary. It became the foundation of an entirely new view of the insect kingdom. The book contained a refutation of the ancient ideas about the propagation and anatomy of the 'bloodless little creatures'; a systematic and very detailed description of the different sorts; a classification of the insect kingdom in four different orders. Moreover, it offered superb engravings, based on Swammerdam's own drawings. 161 This book offered the paradigm par excellence of the change in seventeenth-century reflections on nature: from text to observation, from symbol to structure, from wonder at the singular to wonder at the everyday. 162

Swammerdam's work is one long and passionate call to consider God's creative almightiness even in the humblest creatures. Moreover, he attempted to redefine the notion of the Book of Nature in new terms. Swammerdam's work was the result of a number of factors that had already been manifest for some time: scepticism regarding the textual tradition, emphasis on the underlying order of nature, and a growing appreciation of perception by the senses. The *Historia* and Swammerdam's later work manifest these tendencies in a clearly articulated and radical form.

¹⁵⁹ Swammerdam, Historia, 45-46.

¹⁶⁰ Ruestow, *The Microscope*, 201–259; Cobb, 'Malpighi, Swammerdam'.

¹⁶¹ Cobb, 'Malpighi, Swammerdam'; Jorink, 'Logica van de luis'; Leonhard, 'Kritik an der Hand'.

¹⁶² Cf. Stebbins, Maxima in minimis; Daston and Park, Wonders and the Order of Nature, 316–325; Bono, Word of God, 272.

A biographical sketch

Much has been written on Swammerdam's fascinating life. 163 Since the biographical element is important for an appreciation of his work, and several errors have continued to persist ever since his first biography by Boerhaave (1737), a brief biographical sketch is in place. He has often been portrayed as a solitary genius or a self-destructive mystic whose work barely met with any response at first, and who never carried out any further scientific research after his religious crisis. This picture is incorrect. Swammerdam was a complex personality whose life oscillated between different poles, between a limitless confidence in science and a total surrender to religion, and between unfettered ambition and austere asceticism. Although the scales tipped to one side for a while in 1675, it would be wrong to place all the emphasis on Swammerdam's tormented mind.

Johannes Swammerdam was born in Amsterdam in 1637 as the son of an apothecary and collector of curiosities. Swammerdam studied from 1661 in Leiden under the famous professors Franciscus dele Boë Sylvius (1614–1672) and Johannes van Horne (1621–1670). Together with his fellow student and bosom friend Niels Stensen (Steno, 1638–1686), he excelled in anatomical dissections. In 1664 the two of them were in France, where Swammerdam met Melchisédec Thévenot, who was to emerge as his patron. Thévenot was a typical seventeenth-century *curieux*. In this diplomat, traveller and bibliophile is known above all for the group of scientists who met at his house each week (one of the initiatives from which the Académie Royale des Sciences was to be founded in 1666). Among those who frequented Thévenot's circle were Constantijn and Christiaan Huygens and Isaac Vossius.

¹⁶³ All accounts are based on 'Leeven van den schrijver' by Boerhaave in: Swammerdam, *Bybel*, A2–I2. See, for example: Schierbeek, *Swammerdam*; Wilson, *Invisible World*, 186–189; Lindeboom ed., *Letters*, 3–33; Ruestow, *The Microscope*, 105–145; Cobb, *Egg and Sperm Race*, 31–62, 94–154; Kooijmans, *Gevaarlijke kennis*.

¹⁶⁴ Boerhaave, 'Leeven', A2. According to a tradition that goes back to the nine-teenth century, Swammerdam is usually called 'Jan'. It should be noted however that he was baptized as 'Johannes', and signed his letters and other documents either as 'Johannes' or as 'J. Swammerdam'.

¹⁶⁵ Scherz, *Vom Wege Niels Stensens*; Idem ed., *Nicolaus Steno*; Grell, 'Between Anatomy and Religion'.

¹⁶⁶ Brown, Scientific Organisations, passim; Hahn, Scientific Institutions, 6-8.

¹⁶⁷ OCCH XXII, 544–546, 560–562; OBI IV, 30, 40, 61–62, 89–90; Blok, Vossius, 167; unpublished correspondence between Thévenot en Isaac Vossius is kept in UBA Ms E 10.

When Swammerdam was introduced to them on 18 November 1664, Huygens senior and Vossius junior were also present. Swammerdam and Steno were to deliver lectures and conduct anatomical dissections at Thévenot's weekly meetings. In 1665 Swammerdam returned to the Netherlands, where he obtained his doctorate in 1667 with a thesis on respiration that was strongly influenced by Cartesian physics. After obtaining his title, Swammerdam moved back in with his father, who reluctantly funded the upkeep and 'curious experiments' of his son. 170

Swammerdam's investigations of insects led in 1669 to the publication of his universally acclaimed *Historia*. The turn that the scientist's life subsequently took was not without its problems. His father would have preferred him to earn his own living as a physician, but the call of science was stronger than his father's reprimands. Swammerdam proceeded to carry out the research programme that he had presented in the *Historia*, making increasing use of the microscope, with which he now studied the previously unknown internal anatomy of God's humblest creatures. What he saw made him dizzy. He regularly went to the limits of his ability, as when investigating the nervous system of the bee:

For my vision and instruments failed me; but GOD revealed himself to me again in this wondrous constitution of admirable and unfathomable parts, in which GOD's might and his inexhaustible wisdom are manifest.¹⁷¹

Time and again Swammerdam emphasised that time was too short to investigate all God's wonders. 172

The religious motivation that had characterised the *Historia* changed in 1673 into pure obsession. Swammerdam was convinced that his curiosity had taken him too far. He believed that the pioneering work that he had originally begun in honour of the Creator had now become an end in itself. He accused himself of no longer putting God's honour at the centre of his investigations, but his 'corrupt own will and interest'. 173 He turned to Antoinette Bourignon (1616–1680),

¹⁶⁸ OBI IV, 173; Nordström, 'Swammerdammiana', 34.

¹⁶⁹ Swammerdam, Disputatio medica inauguralis; Idem, Tractatus physico-anatomico-medicus de respiratione.

¹⁷⁰ Lindeboom, *Letters*, 53.

¹⁷¹ Swammerdam, Bybel, 495.

¹⁷² See for example: Lindeboom, Letters, 80.

¹⁷³ Swammerdam, Ephemeri vita, 5.

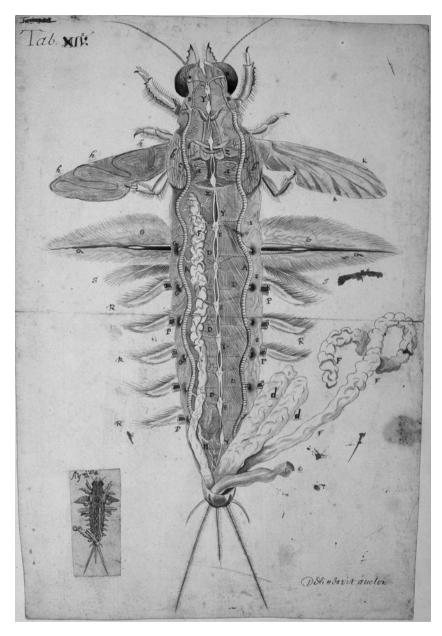


Fig. 35. Original drawing by Swammerdam (ca. 1674), representing the anatomy of the may fly (UBL).

a spiritual guide who proclaimed the renunciation of worldliness, who wrote to him that his researches were nothing but 'amusements of Satan'. 174 On her advice he decided to abandon his scientific pursuits and devote himself solely to 'heavenly reflections'. 175 In 1675 Swammerdam published a prolix treatise on the mayfly, Ephemeri vita, of afbeeldingh van 's menschen leven, vertoont in de wonderbaarelijcke en nooyt gehoorde historie van het vliegent ende een-dagh-levent Haft (Life of the Ephemeron, or illustration of human life, demonstrated in the wondrous and hitherto unknown history of the flying mayfly that lives for a day). In this work he announced his withdrawal from worldliness (including 'sciences and curiosities') and left for Schleswig-Holstein, where he was accepted into Bourignon's community of genuine Christians.¹⁷⁶ This step has earned Swammerdam the name of a mystic or zealot. Extreme though this decision may appear to be, it was temporary and perhaps less exceptional than it seems at first sight. Robert Boyle was fascinated by Bourignon as well, and translated her La solide vertu in English in 1670.177 Deep religious feelings played a role in the case of other natural scientists of the period as well, and sometimes even led them to abandon scientific pursuits. Examples are Blaise Pascal (1623-1662), or Swammerdam's friend Steno, who became a Catholic in 1667 and was appointed as a bishop. 178

However that may be, the *Ephemeri vita* is the last work to be published during Swammerdam's lifetime, and is very different from the *Historia*. Besides exceptionally accurate microscopic observations, it also contains letters from Bourignon, a motivated (but, as was to transpire, not definitive) letter of resignation from the world of science, as well as virtually endless 'moral reflections' on the miserable fate of the mayfly. These were entirely in the spirit of the moralising for which the insect kingdom had traditionally provided such valuable subjects, but which he had sharply criticised in the *Historia*. Neither contemporaries nor later historians knew exactly what to make of this work.

Swammerdam spent about a year in close proximity to Bourignon before returning to Amsterdam in 1676. The reasons for his return

Lindeboom, 'De eerste brief'; De Baar, 'Ik moet spreken'.

¹⁷⁵ Swammerdam, Ephemeri vita, 5.

¹⁷⁶ Swammerdam, Ephemeri vita, 218.

¹⁷⁷ De Baar, 'Ik moet spreken', 218.

¹⁷⁸ Mesnard, *Les penseés de Pascal*; Adamson, *Blaise Pascal*; Scherz, *Stensen*; Grell, 'Between Anatomy and Religion'.

are unclear, but at any rate it was not triggered by a sudden break with Bourignon, for recently discovered letters show that he remained in contact with her at least down to 1678.¹⁷⁹ Swammerdam seems to have been in a more stable mental state and, in spite of what has often been claimed, he resumed his investigations in 1676.¹⁸⁰ He now devoted himself with limitless energy to his 'great work', the microscopic dissection of a huge variety of insects and the description of 'all the wonders concerning them'.¹⁸¹ The militant tone of the *Historia* had given way to a more pious and reflective attitude.¹⁸² Shortly before his death, Swammerdam wrote to Thévenot that his work was almost complete.¹⁸³

This 'great work' was in fact the elaboration of the research programme presented in the *Historia*, in which Swammerdam had divided the insect kingdom into four orders or classes, and discussed each of these on the basis of several species. ¹⁸⁴ This tentative list could be extended quantitatively and qualitatively *ad infinitum*, and that is exactly what he did. Now he observed, not only with the naked eye but above all with the aid of the microscope, the widest variety of insects, ranging from the butterfly to the water louse and from the bee to the cheese mite. After dissection, their internal organs turned out to contain an unsuspected world full of wonders.

Swammerdam did not live to see his life's work published; he died on 17 February 1680. The manuscript was bequeathed to Thévenot, who, in spite of Swammerdam's last wishes, did not publish it. Half a century after Swammerdam's demise the manuscript was tracked down and purchased by Herman Boerhaave, who published it in 1737–1738 under the title of his choice *Bybel der natuure*. The manuscript, which is now kept in the library of Leiden University, is in fact an enormously expanded exemplar of the *Historia*. Contrary to what has been suggested, the title *Bybel der natuure* does not go back to a single passage in a letter of Swammerdam, but is very frequently found in his notes—so often that it can be regarded as a *Leitmotiv*. 185

¹⁷⁹ See the unpublished correspondence between Swammerdam and Bourignon in BLO Ms Ad 96–97; De Baar, '*Ik moet spreken*', 473–480.

Boerhaave, 'Leeven', F2; Lindeboom, 'Korte inleiding'; Wilson, Invisible World, 188.

¹⁸¹ Lindeboom, Letters, 70.

¹⁸² Jorink, "Outside God there is Nothing".

Lindeboom, Letters, 161.

¹⁸⁴ Schierbeek, Swammerdam, 185-218, 271.

¹⁸⁵ Cf. Lindeboom, Letters, 85 note 5; Idem, 'Korte inleiding'.

Historia insectorum generalis

'Part One', announces the title page of Swammerdam's *Historia*. The words suggest a well conceived, ambitious research programme. As a student Swammerdam had already investigated such fairly unorthodox subjects as the eggs of silkworms, crickets, exotic butterflies and East Indian centipedes between 1661 and 1663. His *Tractatus de respiratione* (1667) already promised a treatise *De insectis* 'if God grants us life and health', which was to deal with the transformation from caterpillar into butterfly that Aristotle and Mouffet had misunderstood. 187

The *Historia* was the work of a man with an research agenda as well as a mission. There were three related misconceptions that Swammerdam wanted to expose. First of all, all insects, like the largest creatures, had an internal structure. If that of the 'largest animals' astonished us, that of the 'smallest animals' left us dumbfounded. Second, insects were not born by spontaneous generation. Third, the process of change or transformation (larva, pupa, insect) was purely a question of growth. The transformation of a caterpillar into a butterfly was not the result of an enigmatic metamorphosis, 'wrongly described as change of form, casting off of shape, death and resurrection'. It was a growth process exactly the same as 'a chicken that does not *change* into a hen, but *becomes* a hen as its limbs grow'.

Swammerdam arrived at his revolutionary discoveries by an acutely formulated and consistently followed epistemology.¹⁹¹ This consisted of two, at first sight divergent components, namely a strong emphasis on sensorial perceptions and several philosophico-theological a prioris. To start with the latter, Swammerdam's researches were motivated by the sacred conviction that 'all God's works are based on the same rules'.¹⁹² Swammerdam could not believe that God had created humans and the higher types of animals, but not the insects. In fact, according to Swammerdam there was no distinction at all between the so-called higher types and insects. They both had the same complicated anatomy, mechanisms of propagation, and life phases. The

¹⁸⁶ OBI II, 241.

¹⁸⁷ Swammerdam, Tractatus physico-anatomico-medicus de respiratione, 'Praefatio'.

¹⁸⁸ Swammerdam, Historia, 2.

¹⁸⁹ Ibid., 27.

¹⁹⁰ Ibid., 9, my italics.

¹⁹¹ Cf. Visser, 'Theorie en praktijk'; Ruestow, 'Piety and the Defense of Natural Order'.

¹⁹² Swammerdam, Historia, 'Naa-reden', 3.

Historia is one major attempt to substantiate this position. Its purpose, as Swammerdam repeated page after page, was to provoke piety. All creatures, great and small, everyday and exotic, owe their existence to a single cause:

Namely the inscrutable God and the unfathomable Creator, wondrous and matchless in his works; in which all are based on few rules and unsearchably coherent with one another; he is Good, Wondrous and Worthy of Adoration.¹⁹³

The theory of spontaneous generation would imply that insects are born by chance, in other words, that their generation is the result of blind forces, and thus beyond the reach of God's almightiness.¹⁹⁴ Throughout his life Swammerdam insisted that the belief in spontaneous generation was not only scientifically incorrect, but was essentially godless too.¹⁹⁵ This theory was 'a very obtuse error', 'a falsification of the natural wonders and truths of God in nature', and 'the straight road to atheism'.¹⁹⁶

For if generation were at random, man could be generated in the same way: as some have been rash enough to write: although God is as wondrous in both; for the body of an animal is as wondrous in its way as that of a human in its way.¹⁹⁷

Swammerdam made no secret of the source of his conviction that nature was in principle uniform: it was to be found in the works of the 'great Descartes'. However, unlike many of the radical Cartesians, who believed that natural processes were explicable by reason, Swammerdam repeatedly emphasised that he was speechless. What we see are merely the contours of the shadows of the wonders of God, he stated; we cannot explain them. 199

Cartesianism is not usually immediately associated with empiricism, the second component of Swammerdam's epistemology.²⁰⁰ He was a brilliant observer who accurately described and drew what he perceived, and who was to adhere firmly all his life to the principle of

¹⁹³ Swammerdam, Historia, 28.

¹⁹⁴ Jorink, "Outside God there is Nothing".

¹⁹⁵ See for example: Swammerdam, *Bybel*, 171, 394, 432, 708, 712, 713.

¹⁹⁶ Ibid., 669.

¹⁹⁷ *Ibid*.

¹⁹⁸ Swammerdam, Historia, 'Naa-reeden' 6, 9.

¹⁹⁹ Swammerdam, Historia, 147, 'Naa-reeden', 5.

²⁰⁰ On Descartes, empiricism and medicine see Cook, Matters of Exchange, 226–265.

not believing anything unless he had seen it with his own eyes. Without false modesty. Swammerdam described his own observations as 'an unshakable foundation'. 201 Researchers were exhorted to seek the 'causes or effects of things in nature itself' and not 'in our studies'. 202 This gave an interesting twist to Cartesian epistemology. The empirical tendency that Hoefnagel and Cluyt had initiated was completed by Swammerdam. Unlike his predecessors, however, Swammerdam had little time for the canon of biblical and profane texts and only cited authorities to refute them. So not only the writings from Aristotle to Goedaert were weighed up and found inadequate, but even Malpighi's pioneering microscopic dissection of the silkworm was replicated and corrected by Swammerdam.²⁰³ To the Italian's great irritation, Swammerdam drew his attention to a number of errors.²⁰⁴ Swammerdam could appreciate some of his predecessors—Hoefnagel, Hooke, Redi and Malpighi—but in general he displayed a strong measure of scepticism with regard to the classical and contemporary literature.

Swammerdam tried to prepare, dissect, describe and draw the insects that he collected himself or that he received from his numerous contacts. He had keen eyesight, a steady hand, and developed a pioneering technique for preparation.²⁰⁵ The specimens were all kept by Swammerdam in his cabinet to bolster his claims and to the glory of God's works. Swammerdam's observations of the internal organs of insects led to an annihilating attack on a number of traditional assumptions. He discovered that the head of a swarm of bees was not a king but a queen, as it proved to possess female sexual organs.²⁰⁶ At least as revelatory was the discovery that the change from caterpillar to pupa to butterfly was a gradual process. Goedaert and many others had been wrong to believe that the caterpillar died before the butterfly was resurrected from its remains. On the contrary, Swammerdam proudly stated that, in the presence of Thévenot, Cosimo de' Medici and others, he had demonstrated how parts of what would later become a butterfly were already present in the caterpillar.²⁰⁷

²⁰¹ Swammerdam, *Bybel*, 'Aan den waarheid beyverende leeser'.

²⁰² Swammerdam, *Historia*, 147-149.

²⁰³ Lindeboom, *Letters*, 63; Swammerdam, *Miraculum naturae*, 16–18; Idem, *Bybel*, 77, 123. See also: Cobb, 'Malpighi, Swammerdam'.

²⁰⁴ Correspondence of Marcello Malpighi II, 598.

²⁰⁵ See also: Cook, Matters of Exchange, 278–290.

²⁰⁶ Swammerdam, Historia, 105.

²⁰⁷ Ibid., 27.

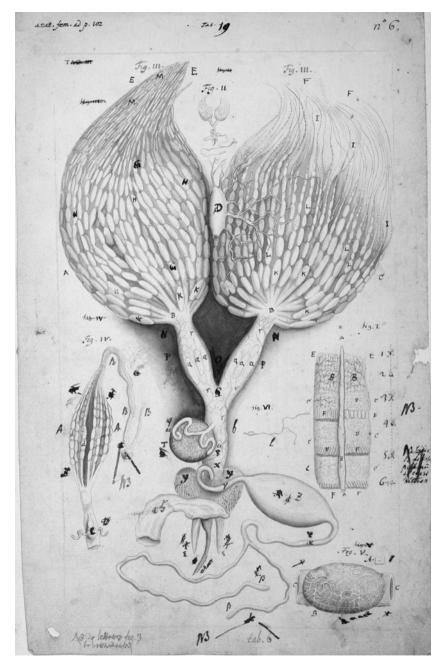


Fig. 36. In 1668, Swammerdam discovered that what was usually considered the king of the bees, turned out to be a queen. In this original drawing, we see the ovaries and egg masses (UBL).

These discoveries were of great importance for the knowledge of insects and the debates on propagation, but they also had enormous consequences for the traditional, symbolic interpretation of insects.²⁰⁸ In a way that is strongly reminiscent of the attack of Graevius and his supporters on the fear of comets, Swammerdam combated the traditional view of insects, thereby prising them loose of their biblical and emblematic context. Swammerdam stated boldly that his discoveries meant that traditional analogies were no longer tenable. The familiar metaphor of the beehive, for instance, could no longer be used now that it was known that the head of the swarm was a queen.²⁰⁹ When Swammerdam discovered butterfly organs inside a caterpillar, he remarked:

This clearly exposes the error of those who have wanted to prove the resurrection of the dead by these natural and intelligible changes, which not only goes entirely beyond the order that can be observed in nature, but has no parallel in nature either.²¹⁰

Swammerdam's orientation was fundamentally different from that of a writer such as Goedaert. They studied the same creatures, but saw something completely different. Goedaert had represented pupae with unmistakably anthropomorphic features. Swammerdam sarcastically called 'these drawings based only on his imagination' 'farcical' and 'grotesque'.²¹¹

This was all the result of a difference in spiritual orientation. The pious Goedaert had seen spontaneous generation as a given, regarded it as an unfathomable wonder of God, and based all kinds of religious interpretations on this. Swammerdam proceeded from the axiom that everything in nature obeys the same 'rules and order', which was the proof of the existence of 'a wise and exceptional Spirit'.²¹² For Swammerdam the source of religion is no longer the analogy between the metamorphosis of a caterpillar into a butterfly and the resurrection, but the incomprehensible anatomy of these creatures. God's almightiness was visibly and legibly 'represented' in their internal organs.

²⁰⁸ On the debates on propagation: Bowler, 'Preformation and Pre-existence'; Wilson, *Invisible World*, 103–175; Ruestow, *The Microscope*, 200–259; Fournier, *Fabric of life*, passim; Smith ed., *The Problem of Animal Generation*; Cobb, *Egg and Sperm Race*.

²⁰⁹ Swammerdam, Historia, 136.

²¹⁰ Ibid., 28.

²¹¹ *Ibid.*, 18, 21.

²¹² *Ibid.*, 1–3.

More generally, we can state that for Swammerdam nature was not a complex ensemble of largely arbitrary symbols whose meaning was derived from the written tradition. All creatures pointed *linea recta* in the same direction: to the Creator.

The difference between Swammerdam's and Goedaert's approach at this time can only partly be attributed to the use of the microscope. Both men made only sporadic use of the instrument. Swammerdam already had access to a microscope in 1663, presumably thanks to Hudde, but until 1669 his researches were mainly based on natural philosophical axioms and a keen eye.²¹³ At most, the insect was inspected with a magnifying glass to conclude the analysis. In other words, it was not Swammerdam's microscopic investigations that led to his reflections on God's revelation in the creation, but vice versa.

The study of the Bible of Nature

Swammerdam repeatedly insisted in the *Historia* that it was the duty of every Christian to study God's creation, including the minuscule insects, as closely as possible, since 'invisible things can be known from the visible'.²¹⁴ Time and again he cited or paraphrased the familiar passages from *Romans* 1:20 and the Belgian Confession. In the years of and after his religious crisis, he meditated profoundly on the traditional doctrine of the Book of Nature and devoted many passages to it. They indicate that he deviated from Reformed orthodoxy in two significant ways. First, he regarded the Book of Nature and the Bible as two relatively *independent* sources of knowledge of God. Second, for Swammerdam nature had lost its textual, hermeneutic character. It was solely the visible *structure* that referred to God.

There is no doubt that Swammerdam was a pious man with an impressive knowledge of the Bible, even by seventeenth-century standards, but his entomological descriptions are almost entirely lacking in biblical passages. He made no attempt to identify the locusts and other creatures of the Old Testament, nor did he engage in many of the symbolic allusions in which Hoefnagel, Cats and Goedaert indulged. Instead, the entire emphasis was on God's revelation in the creation. In line with the traditional natural theology, Swammerdam stressed

 $^{^{213}}$ Fournier, 'Book of Nature'; Eadem, *Fabric of Life*, 62–72 and passim; Ruestow, *The Microscope*, 105–145.

²¹⁴ Swammerdam, *Historia*, 'Naa-reeden', 10.

that even those who did not know the Bible could still recognise God in nature:

Who is not delighted and convinced when he rightly considers these wonders of God? For verily this remarkable treatise shows incontrovertibly that the omniscient and good God is understood and known from his visible things, in that he reveals his invisible things so powerfully to us in the visible ones, so that his eternal godhead is displayed there radiantly; so that no one should be pardoned in his sin who has received the law of nature, the law of Moses and that of the gospel; after which all peoples will be judged, whether they shall be acquitted or condemned.²¹⁵

Or, as Swammerdam put it in another passage, the creation is 'the book of nature, the Bible of natural theology...in which God's invisibility is made visible'. ²¹⁶

The study of nature was thus by no means an arbitrary matter, but a direct confrontation with the Most High. It was as serious a matter as the interpretation of Holy Scripture. Swammerdam thus regarded mortals who were careless in reading the Book of Nature as downright sinners. The main butt of his criticisms was the approach of Goedaert, who 'seems to describe a novel rather than a genuine history'. The *Historia* contains long diatribes against the late Goedaert to expose his 'mistakes', 'errors', 'falsehoods' and 'terrible blunders'.

The creation had to be studied with one's own eyes since the textual tradition was corrupt and inaccurate. Nature was a 'pretty picture' that 'has become dirtied and contaminated' by 'our fancies' and 'corrupt traditions'.²¹⁹ Swammerdam intended his own investigations to remove those layers of varnish and dirt so that the painting would be restored 'in all its radiance and beauty'.²²⁰ One is immediately reminded of biblical criticism in the spirit of Erasmus: the closer to the original text, the closer to God.

Swammerdam's ideas therefore fitted into the metaphor of the Book of Nature in which, as Augustine had put it, the illiterate could read too:

²¹⁵ Swammerdam, *Bybel*, 616.

²¹⁶ *Ibid.*, 394. See also *Ibid.*, 85.

²¹⁷ Ibid., 487.

²¹⁸ Swammerdam, *Historia*, passim.

²¹⁹ *Ibid.*, 56-57.

²²⁰ Ibid., 57.

Only I recommend that someone who wants to know the truth should go and look for it in nature itself. For it exceeds all the writings and treatises that can be written about it, and it teaches in a moment of time more than many books can teach in many years. Nature is like a *permanently open book* in which its wonders can be understood much more easily and readily than in the tales of the weak-minded.²²¹

Swammerdam was highly critical of researchers who worked carelessly. They were not just vain pedants, but little less than blasphemers, 'for truth and conscience must also be perceived in natural history, because it is a Bible of God's wonders'.²²²

In short, the notion of the Book of Nature plays a crucial role in Swammerdam's oeuvre. It was the duty of every man to study God in his creatures and 'to cry aloud the praise of the great Creator, the Supreme Artist'. Swammerdam was therefore considerably agitated in 1678 when Steno, who had just been appointed bishop, no longer devoted himself to the study of the Book of Nature but merely tried to win souls. 224

It is noteworthy that Swammerdam described nature as both the Book and the Bible of Nature. The latter designation is the commonest. Is this a reference to the sacred character of nature which shows every mortal the almightiness of God in a relatively autonomous fashion, and thus without knowledge of the Old and New Testament? Swammerdam never comments explicitly on his vocabulary, but the possibility cannot be ruled out. Whatever his motivation may have been, Swammerdam's use of the concept tied in with the conventional understanding of the Book of Nature in the Dutch Republic, but gave it a new and very important twist. The Book (or Bible) of Nature is not primarily to be read on the basis of sacred or profane texts, but is an independent source of knowledge about God. Swammerdam here appears to be deploying contemporary means to hark back to classical natural theology in the spirit of Cicero and Seneca.²²⁵ Neither the text of the Bible nor all kinds of analogies and similes yield the key to interpreting the Book of Nature. It is the structure of the Book that points

²²¹ Swammerdam, *Ephemeri vita*, 202–203; italics by Swammerdam.

²²² Swammerdam, *Bybel*, 418.

²²³ *Ibid.*, 502.

²²⁴ Lindeboom, Letters, 81-82.

²²⁵ Leibniz noted in a letter to Thévenot, 24 August 1691: 'Luy [Swammerdam] et Stenonis laisser là la Theologie doctoralle et poursuivre la Theologie naturelle où ils estoient appellés', Leibniz, *Sämtliche Schrifte und Briefe*, Ie Reihe, VII, 354.

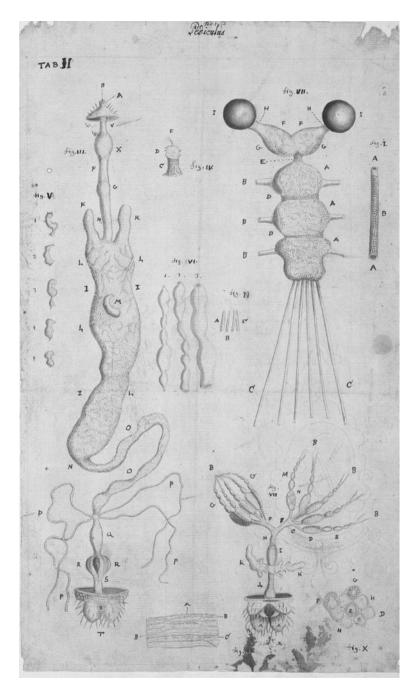


Fig. 37. 'Herewith I offer you the Omnipotent Finger of God in the anatomy of a louse', Swammerdam wrote in 1678 to Thévenot. Figure iiii shows the gastrointestinal tract; figure viii the (female) uterus (UBL).

to a higher power. God can be seen just as well in the louse or the bee as in the elephant. Moreover, God is an artist rather than a legislator, an architect rather than a writer. For instance, Swammerdam deduced from the anatomy of a snail 'the inventions and unprecedented wonders that the all-seeing architect has concealed in the Bible of his creatures'. And in his treatise on the cheese mite, he wrote to Thévenot: 'What atheist who considered the inexhaustible artistry of the internal organs of animals would not be ashamed and dumbfounded, my Lord?' What we see here is the physico-theological argument from design in its purest form.

It is also striking that Swammerdam adopts an aggressive tone instead of the generally moderate one with which earlier Dutch theologians and natural scientists had tried to bring the Book of Nature to the attention of Epicureans, atheists and other infidels. Swammerdam was a master or rhetoric who could be down to earth, lyrical, witty or downright cruel. Nieuwentijt's *Regt gebruik*, written thirty years later, seems tame compared with the acerbity with which Swammerdam attacks the atheists on page after page.²²⁸

The influence of Swammerdam

Historians are rightly agreed that it is thanks to Swammerdam that the study of insects could grow to become an independent scientific discipline as well as an extremely popular pastime in the course of the eighteenth century. There is also agreement that the arguments used by Swammerdam in this connection played an important part in the later physico-theology. Swammerdam's influence is directly attributed to Boerhaave's edition of his posthumous work, the *Bybel der Natuure* (1737–1738).

Less is clear regarding Swammerdam's influence in the sixty years between his active life and the appearance of his *magnum opus*. The *Historia* was an important work, even though it had been written almost entirely without the use of a microscope. Then as now, there was a lack of understanding of the *Ephemeri vita*.²²⁹ Swammerdam is still portrayed as a tormented, isolated and rather vague figure who

²²⁶ Swammerdam, Bybel, 172.

²²⁷ *Ibid.*, 705.

²²⁸ Compare for example Swammerdam, *Bybel*, 705 and Nieuwentijt, *Regt gebruik*, 563.

²²⁹ See for example the letter of Justel to Oldenburg, 12 August 1675, CHO XI, 453.

fell outside the intellectual mainstream of his day.²³⁰ However, it cannot be denied that for almost his entire life, including the period after his stay in Schleswig-Holstein, Swammerdam deliberately manifested himself in the scholarly arena. It would appear that he had to fight constantly against an excessive ambition rather than being a basically mystical hermit. 'You do well, my good friend Oldenburg, and act the part of a friend properly when by repeated letters you recall me to the contemplation of nature, thinking me languid and unmindful of my former concerns', Swammerdam wrote to the secretary of the Royal Society after returning from Bourignon's sect in 1677. But to confess what is true, I have more need of the bridle than the spur; by my nature I am wholly impelled towards this kind of activity'. 231 By then the Society had already been closely following Swammerdam's investigations for years, and was disappointed in 1670 by the fact that the Historia was only available in Dutch at first. 232 Swammerdam initiated the correspondence with Oldenburg in 1672.²³³ Some observations by Swammerdam were published in the *Philosophical Transactions*. ²³⁴ The Society showed an interest in acquiring Swammerdam's cabinet around 1678.235

Swammerdam was active in other societies too. Thévenot's circle has already been mentioned. It is particularly interesting to note that Swammerdam also played a role in its counterpart in Utrecht, the *collège de sçavants* discussed in the previous chapter. Various sources indicate that Swammerdam was on friendly terms with Graevius and his associates and regularly took part in the discussions that they conducted on matters of theology and natural philosophy.²³⁶ The similarity between the debate on comets and Swammerdam's attack on insect symbolism was clearly more than a coincidence. Swammerdam and the *sçavants* shared similar views on superstition and on God's revelation in the creation.²³⁷

²³⁰ See for example Ruestow, *The Microscope*, 105, 130.

²³¹ CHO XIII, 343.

²³² CHO VII, 71; Philosophical Transactions, no. 64 (1670) 2078–2080.

²³³ CHO VIII, 617.

²³⁴ For example 'An extract of a letter...of an unusual rupture in the mesentry', *Philosophical Transactions*, no. 112 (1675) 273–274.

²³⁵ CHO XIII, 343; Lindeboom, Letters, 86–87.

²³⁶ Sylloges epistolarum IV, 489–490; Stenonis epistolae I, 213–214; Lindeboom, Letters, 63.

²³⁷ Jorink, "Outside God there is Nothing".

So in spite of the somewhat exalted tone of some of his passages, Swammerdam was a key figure in the scientific world of his day. That fact is more important than the question of how normal or abnormal he was. Scholars such as the Huygens brothers and dilettantes were treated to demonstrations of Swammerdam's skill in dissecting insects.²³⁸ He learnt the art of producing lenses early on from Hudde, with whom he remained in contact all his life, and breathed his last in a house that belonged to Hudde's wife, Debora Blaeu (1629-1702). 239 Other public figures, such as the influential mayors of Amsterdam Nicolaes Tulp (1593-1674), Coenraad van Beuningen (1622-1693) and Jan Six (1618-1700), regularly came to watch Swammerdam at work.²⁴⁰ Constantijn Huygens visited Swammerdam in 1674 while he and the Leiden professor of botany Arnold Seyen conducted dissections on an advanced dissection table with microscopes mounted on flexible arms, 'a philosophical road more authentic than any other' as he wrote to Oldenburg.²⁴¹ Swammerdam was also on friendly terms with such famous scholars as Dele Boë Sylvius, De Raey, De Volder and Witsen; the latter owned manuscripts and drawings by Swammerdam, as he wrote to Henry Oldenburg in 1672.242

Swammerdam's contacts abroad were equally numerous. Steno kept Redi and Malpighi informed about the progress of Swammerdam's investigations. In 1676 Swammerdam was visited by a young and ambitious German, Gottfried Wilhelm Leibniz (1646–1716), who was travelling through the Dutch Republic, where he also met Spinoza, Van Leeuwenhoek and Hudde.²⁴³ After Swammerdam's death, Thévenot sent Leibniz 'some writings by Mr Swammerdam', including extracts from the posthumously published *Bybel der Natuure*.²⁴⁴ Swammerdam also knew another influential philosopher in person: Nicolas de Malebranche (1638–1715), who achieved a synthesis of

²³⁸ Lindeboom, Letters, 57, 123.

²³⁹ Swammerdam, *Historia*, 81; Lindeboom, 'Swammerdam als Amsterdammer', 68–69.

²⁴⁰ Swammerdam, *Miraculum naturae*, 38, 45; Idem, *Ephemeri vita*, 174; Idem, *Bybel*, 142.

²⁴¹ BCH VI, 344; CHO X, 459.

²⁴² Lindeboom, Letters, 55, 58, 64; CHO VIII, 396-397, 617.

²⁴³ Müller and Krönert, *Leben und Werke von Gottfried Wilhelm Leibniz*, 46. On Leibniz's visit to the Dutch Republic (and some speculations on his ulterior motives) see: Stewart, *The Courtier and the Heretic.*

²⁴⁴ Leibniz, Sämtliche Schrifte und Briefe, 1. Reihe III, 504.

Augustine and a Cartesian inspired occasionalism.²⁴⁵ In all likelihood Swammerdam met the Oratorian cleric during his stay in Paris in 1665. They remained in contact until shortly before Swammerdam's death.²⁴⁶ Malebranche regularly referred to Swammerdam's published work.²⁴⁷ According to a passage in his *Entretiens sur la métaphysique et réligion* of 1688, he owned a copy of Swammerdam's treatise on bees, which had not been published at the time.²⁴⁸ In the spirit of Swammerdam, he stressed that 'these little creatures are the work of an infinite wisdom'.²⁴⁹

It was above all the *Historia*, translated into French in 1682 (reprinted in 1685) and into Latin in 1685 (reprints in 1693 and 1733), that demonstrably made a great impact on the changing conceptions of God's creation. John Ray, the author of the extremely influential *Wisdom of God manifested in the works of creation* (1691), was working on a book on insects that was eventually published in 1710.²⁵⁰ He wrote to James Petiver that he wanted to follow the method of Swammerdam's *Historia*, 'which seems to me the best of all. It would be long to describe it, and therefore I refer you to the book'.²⁵¹

4. The insect bug around 1700

The way insects were considered in the Dutch Republic at the beginning of the eighteenth century was radically different from the situation of a century earlier. They were no longer primarily seen as symbols, but as entities worthwhile to collect, study, illustrate and describe individually and per sort. While only a few sorts appeared in a separate monograph, emblem book or still life around 1600, by 1700 numerous books, prints and drawings were dedicated to the most diverse families. Collections of insects were now often the most spectacular part of the well-filled Dutch cabinets of curiosities, and a major role was

²⁴⁵ Rodis-Lewis, 'Sources scientifiques'.

²⁴⁶ Lindeboom, Letters, 154; Swammerdam, Bybel, 705.

²⁴⁷ Malebranche, Oeuvres complètes I, 83, 202; XXII, 460.

²⁴⁸ *Ibid.*, XII, 230.

²⁴⁹ *Ibid.*, XII, 267.

²⁵⁰ Raven, John Ray; Gillespie, 'Natural History, Natural Theology'.

²⁵¹ BL Ms Sloane 4063, fol. 210. According to a letter of Ray to Petiver, 17 May 1704, BL Ms Sloane 4064, fol. 9, Ray owned the French translation of Swammerdam's *Historia*.

reserved in them for more everyday sorts. The scientific world seemed to have become infested by an insect bug.

A number of related factors seem to have contributed to this development. The increasing contacts between East and West yielded an enormous quantity of spectacular and previously unknown *insecta*. The microscope also appealed strongly to the imagination. However, the development was due above all to the popular works of Goedaert and Swammerdam, who each in his own way summoned the Dutch public not to disregard God's 'humblest creatures'. Whether or not their work held such a fascination because it appealed to a typically Dutch appreciation of the large in the small and a predilection for the detail will never be proven, but it certainly is a fact that many publications and manuscripts that were dedicated to insects at the end of the seventeenth and the beginning of the eighteenth centuries continued to refer to these two pioneers.²⁵² The enormous interest in insects can be demonstrated on the basis of a number of better known and lesser known scholars and virtuosi.

Antoni van Leeuwenhoek

Swammerdam's *Historia* was very popular, but his microscopic studies were for the time being only known to a small but influential group of intimates. In the eyes of a much broader public, it was primarily the other great Dutch microscopist, Antoni van Leeuwenhoek (1632–1723), who drew attention to God's greatness in the anatomy of insects. Swammerdam's *magnum opus*, with its wonderful balance of observations and eloquent calls to piety, was gathering dust in France. Van Leeuwenhoek never wrote a complete treatise on an insect, but in the course of his long life his observations soon achieved widespread popularity and were seen as powerful demonstrations of the almightiness of the Lord in even the tiniest of creatures.

The two microscopists had met, but they did not hit it off.²⁵⁴ Van Leeuwenhoek was discourteously criticised by Swammerdam and was

²⁵² On the Dutch predilection for the detail see for example Segal, *Prosperous Past*; Bol, 'Goede onbekenden'; Alpers, Art of Describing, 1–118; Van Berkel, Citaten, 11–23.

²⁵³ On Van Leeuwenhoek: Dobell, *Leeuwenhoek*; Schierbeek, *Antoni van Leeuwenhoek*; Palm and Snelders eds, *Antoni van Leeuwenhoek*; Wilson, *Invisible World*, passim; Ruestow; *Microscope*, 146–200, Fournier, *Fabric*, passim.

²⁵⁴ Jorink, 'De profeet en de boekhouder'.

later accused, he insinuated, of having made off with some of Swammerdam's discoveries.²⁵⁵ Swammerdam's opinion of Van Leeuwenhoek was that he was 'opiniated and very barbaric in his reasoning, not having studied'.²⁵⁶ He touched on a sore point.²⁵⁷ Van Leeuwenhoek had a minimum of education, did not know any foreign languages, and had a very skimpy knowledge of the scientific literature. This self-taught man was businesslike, sensitive to status, and fairly indifferent with regard to religion.²⁵⁸ If Swammerdam was a prophet, Van Leeuwenhoek was an accountant.

Van Leeuwenhoek began his researches around 1670. His talent was spotted by the Delft physician Reinier de Graaf (1641-1673), who introduced him to the Royal Society. Huygens senior also sent letters of recommendation to London on his behalf, noting that 'our honest Citizen...is a person unlearned both in sciences and languages, but of his own nature exceedingly curious and industrious'. 259 With his matchless microscopes, Van Leeuwenhoek studied practically everything that came or crept his way: rainwater, a piece of wood, blood, hair, all kinds of living beings, and even his own excrement. Among his most spectacular discoveries were the human and animal spermatozoids and the micro-organisms that had been totally unknown and inconceivable until then.²⁶⁰ Unlike Swammerdam, Van Leeuwenhoek did not work systematically on a precisely defined theme or book, but made notes on his findings in letters, often jumping from one subject to another, over a period of half a century. He sent most of them to the Royal Society, which published them in translation in the Philosophical Transactions. Sendtbrieven (dispatches) also appeared in Petrus Rabus' journal Boekzaal van Europe (Reading room of Europe). They were also collected and published with great success from 1684 on by the Delft publisher Van Kroonevelt.²⁶¹

It almost goes without saying that Van Leeuwenhoek also scrutinised insects. His first two contributions to the *Transactions* already

²⁵⁵ ABL I, 144.

²⁵⁶ Lindeboom, Letters, 106.

²⁵⁷ Van Berkel, 'Intellectuals against Van Leeuwenhoek'.

²⁵⁸ Ruestow, *Microscope*, 146–174.

²⁵⁹ BCH VI, 330. See also Ibid., 343-344.

²⁶⁰ Bowler, 'Preformation'; Ruestow, 'Images and Ideas'; Cobb, *Egg and Sperm Race*, 88–219.

²⁶¹ Van der Saag, 'Rabus en Van Leeuwenhoek'; De Vet, Rabus, passim.

contained descriptions of bees and lice.²⁶² In the succeeding decades he was to study mites, mosquitoes, fleas, wasps, butterflies and scorpions. Van Leeuwenhoek was not interested in the humanist tradition. Like Swammerdam, he was an outspoken opponent of the theory of spontaneous generation. He wrote, for example, that he 'had dissected lice, and taken from them eggs, which we call nits, and from these eggs again lice'.²⁶³ After examination of the anatomy of the louse, the compound eye of the fly, or the metamorphosis of the caterpillar, he wondered whether there could

...still be found people who will dare to maintain, like the idle talk of Aristotle and his followers, that such perfect creatures as described above, however insignificant they may appear to us, are generated spontaneously or from putrefaction?²⁶⁴

Unlike Swammerdam, however, Van Leeuwenhoek had no penchant for metaphysical pronouncements. This emerges clearly, for example, from his repeated dissections of bees. He qualified the symbolic notions of Clutius on bees as figments of the imagination.²⁶⁵ A bee was simply one of many research objects, not a symbol of the relation between God and humankind. In this connection too, Van Leeuwenhoek did not resort to the argument from design that Swammerdam had kept on repeating. Van Leeuwenhoek wrote on several occasions that he was unable to understand the perfection of the construction of insects, but hardly anywhere did he attribute this to the almighty architect.

It is important at this point to note that Van Leeuwenhoek's indifference was not shared by others. On the contrary, many of his contemporaries added a religious component to his discoveries. An example is the reaction of his (anonymous) assistant, whose job it was to draw the anatomy of a flea. The assistant betrayed a sensibility worthy of Swammerdam. Van Leeuwenhoek wrote that

it was impossible for the Draughtsman to depict those parts that could be seen. This Draughtsman, while he was drawing either the Leg or other parts, often burst out with the words: DEAR GOD, WHAT WONDERS THERE ARE IN SUCH A SMALL CREATURE!²⁶⁶

²⁶² ABL I, 29-39; 42-61.

²⁶³ ABL II, 245.

²⁶⁴ ABL X, 131.

²⁶⁵ ABL XIII, 128.

²⁶⁶ ABL IX, 237.

Similar reactions could be heard in the circles of the Royal Society, where the religious motivation to carry out research on nature grew stronger with the years.²⁶⁷ The religious comments in Van Leeuwenhoek's correspondence with members of the society increased in the course of time, probably to charm his readers.²⁶⁸ The same can be seen in one of his letters to the orthodox Nicolaes Witsen, who sent the investigator information and specimens from every corner of the world. Van Leeuwenhoek answered piously that eventually research on nature would reveal the truth:

For we cannot glorify the Lord and maker of the All more than by seeing with the greatest admiration His supreme wisdom and perfection revealed in all things, however small they may be to our naked eye.²⁶⁹

Generally speaking, however, there was a certain discrepancy between the words of Van Leeuwenhoek and the way they were interpreted by his readers. When Van Leeuwenhoek's letters were published in the *Boekzaal van Europe* between 1693 and 1696, the editor, Petrus Rabus, regarded him as a powerful ally in the struggle against superstition and atheism. Thanks to Van Leeuwenhoek's descriptions of the anatomy of insects, the reader could 'recognise the immense wisdom of the supreme overseer', Rabus stated time and again. Another self-appointed opponent of superstition, Balthasar Bekker, also warmly recommended the reading of the *Sendtbrieven*. Encomia of Van Leeuwenhoek claimed that his discoveries 'silenced the godless', and Nieuwentijt naturally made frequent reference to Van Leeuwenhoek in his *Regt gebruik*. 272

This reaction is typical of the reception accorded Van Leeuwenhoek. He became an international celebrity who received visits from an endless procession of princes, scientists and *curieux* until his death in 1723. The reporting of his microscopic observations dealt a blow to traditional ideas about the anatomy and generation of insects and the related emblematic interpretation. While Swammerdam's empiricism was based on a well-considered, theological and philosophical foundation, in the case of Van Leeuwenhoek it appears to have been the result

²⁶⁷ Wilson, Invisible World, 176-214.

²⁶⁸ Ruestow, The Microscope, 166-167.

²⁶⁹ ABL XI, 239.

²⁷⁰ Boekzaal van Europe 2 (1693) 10.

²⁷¹ Bekker, Betoverde Weerelt IV, 10-11.

²⁷² Boitet, Beschryving der stadt Delft, 767; Nieuwentijt, Regt gebruik, 565.

of a lack of familiarity with the canon. The final result was the same: symbolic notions of insects were replaced by a down-to-earth description of their internal structure.

Although the quality of Van Leeuwenhoek's microscopes was not to be equalled until the nineteenth century, his work encouraged many non-professionals to take a look through the viewer of one of these instruments.²⁷³ The 'learned gentlemen philosophers' towards whom Van Leeuwenhoek was ambivalent were offered a view of God's creative almightiness in the world of the everyday and the minuscule thanks to his work. Unintentionally, Van Leeuwenhoek supplied an overwhelming quantity of ammunition with which the eighteenth-century physico-theologians would attack the godless.

Stephan Blankaart

No one in the Dutch Republic or elsewhere could match the observations of Swammerdam and Van Leeuwenhoek, but this did not mean that the study of the 'bloodless creatures' entered a period of decline. This is well illustrated by the work that the Amsterdam physician Stephan Blankaart (1650–1704) published in 1688, *Schouw-Burg der Rupsen, Wormen, Maden en Vliegende dierkens daar uit voorkomende* (Theatre of butterflies, worms, maggots and flying creatures produced by them), whose design in particular seems to have been inspired by Goedaert's successful *Metamorphosis*. Blankaart wrote a second volume around 1695, but it was never published.²⁷⁴ Although an obscure figure today, Blankaart was famous at the time, and his many works on medicine, botany and philosophy were often reprinted and translated.²⁷⁵

Blankaart's book too was the result of a long fascination with the metamorphosis of insects. Every time he visited a patient he went into the garden to see if there was anything of interest there. Like Goedaert and Swammerdam, he cultivated insects, observed their metamorphosis, and made notes and drawings. He regularly observed them through a rather crude microscope.²⁷⁶ He did not dissect them, but made fairly rough sketches of their appearance.

²⁷³ Fournier, 'Drie Zeeuwse microscopisten'.

²⁷⁴ The manuscript is kept in KB Ms 71 J 52. The original drawings of part I of the *Schouw-Burg* are also kept here: KB Ms 71 J 51.

On Blankaart see: Thijssen-Schoute, Nederlands cartesianisme, 318–337.

²⁷⁶ See for example Blankaart, *Schouw-Burg*, 88, 102, 146–150, 160; KB Ms 71 J 52, fol. 65/r.



Fig. 38. Frontispiece of Stephan Blankaart's *Schouwburg* (1680) shows the popularity of collecting insects among Dutch *virtuosi* (KB).

Blankaart firmly rejected the theory of spontaneous generation, which he regarded as in complete contradiction to the almightiness of God.²⁷⁷ He confined himself to a down-to-earth description of what he saw without attaching symbolic importance to it. In other respects he was indebted to Swammerdam's *Historia*, which he regularly cited with approval.²⁷⁸ He also considered that researchers should first study the phenomena by themselves, independently of the authority of others. If necessary, they should also carry out experiments, for example to prove the incorrectness of the theory of spontaneous generation. A piece of meat that was kept airtight did not produce insects. Meat that was kept without such protection proved to produce insects, but proper observation revealed that they were born from minuscule eggs.²⁷⁹

Blankaart's work is illustrative of the disappearance of a symbolic interpretation of insects in favour of a description of their (external) anatomy. It is also symptomatic of the growing popularity of collections of everyday insects at the end of the seventeenth century. This can already be seen on the title page of the Schouw-Burg, which shows collectors with the caterpillars, butterflies and boxes in which they were kept. This was a new trend. Well-to-do citizens in the Dutch Republic had started to form collections of curiosities and naturalia at the end of the sixteenth century, but, as mentioned above, they contained no insects except for the odd biblical locust. Swammerdam was the first to form a large collection. Besides more exotic specimens, it included everyday Dutch butterflies, bees, wasps, beetles and cockroaches, all kept not only to back up his writings but also to induce pious sentiments among the few visitors who were admitted. The trend accelerated from then on, and by the last decade of the seventeenth century spectacular cabinets with insects were to be found in the Dutch Republic. Blankaart, for instance, repeatedly referred to the insects he had been given by his friend, the well-known collector Simon Schijnvoet (1653-1727), who was a 'great lover of these creatures'.280 Other friends and acquaintances from all over the country sent Blankaart 'beautiful caterpillars' and other insects.²⁸¹ Blankaart kept his collec-

²⁷⁷ See for example Blankaart, Schouw-Burg, 2, 202.

²⁷⁸ See for example *Ibid.*, 28, 31, 101, 142, 149, 172, 175.

²⁷⁹ *Ibid.*, 2.

 $^{^{280}}$ See for example $\mathit{Ibid.},\,11,\,12,\,44;\,KB$ Ms 71 J 52, fols 19, 62. On Schijnvoet: Van de Roemer, 'Neat Nature'.

²⁸¹ See for example KB Ms 71 J 52, fol. 87/r.

tion 'in a cabinet decorated with several horns and shells'.²⁸² To meet the demands of the growing numbers of collectors, the last chapter of the *Schouw-Burg* contained tips on how to catch and prepare insects. It is hardly surprising that Blankaart's work, like that of Goedaert, could be found in many libraries of collectors of naturalia.²⁸³

Collectors and insects

During his visits to the Dutch Republic in the late 1660s, Cosimo de' Medici was fascinated by the collection of insects of Swammerdam. Later attempt to purchase this cabinet failed, but the Florentine retained a lifelong interest in how naturalia were studied and collected in the Dutch Republic.²⁸⁴ In 1714, by which time he had become Grand Duke, he sent a legate to the Low Countries to report on the state of affairs of such studies and collections.²⁸⁵ Among those whom the legate, Jacopo Guidicci, visited was the artist Maria Sybilla Merian (1647–1717), known for her illustrations of insects, and Levinus Vincent, known for his famous collection of curiosities, where he was particularly struck by 'certain species of rare animals from all parts of the world, and in particular an infinite number of very well preserved insects'.²⁸⁶

Numerous other sources bear witness to the splendours that could be seen in the Dutch Republic: shiny beetles, multi-coloured butter-flies, gigantic spiders, and so on. There was probably no other country in Europe with such large collections of domestic and exotic insects. Dutch collectors such as Schijnvoet, d'Acquet, Vincent, Witsen and Seba were in close contact with one another and had good relations with East and West. A very lively exchange developed between the collectors and with members of the Royal Society who welcomed the opportunity to benefit from the flood of exotic specimens from the East Indies. The Sloane manuscripts in the British Library, for instance, are indicative of an intensive exchange of information, books, illustrations and specimens. For instance, in 1727 Albertus Seba presented Hans Sloane, the president of the Royal Society, with two enormous

²⁸² Blankaart, Schouw-Burg, 49.

²⁸³ Van der Waals, 'Met boek en plaat', 222.

²⁸⁴ Lindeboom, Letters, 70.

²⁸⁵ Van Veen, 'Cosimo de' Medici's reis'; Van Veen and McCormick, *Tuscany and the Low Countries*, 44-45.

²⁸⁶ ASF Misc. Med. 92 ins. 1, fol. 99/r.

manuscripts containing beautifully coloured sketches of insects, systematically arranged by continent and sort.²⁸⁷ Contacts were not always equally smooth. Seba repeatedly had to advise his correspondents to pack the butterflies with more care, 'not flattened or damaged, because I don't like that'. 288 In 1703 Vincent reported to James Petiver that the awaited boxes of butterflies from Surinam had been lost through an attack by French corsairs, 'much to our regret'. 289 These, however, were minor incidents that did not halt the spectacular growth of the numbers of insects in cabinets. The numerous specimens were displayed, often arranged by sort, and rendered in all their variegated beauty by artists, many of whom have remained anonymous. A strikingly large number of collections of drawings of insects are extant from this period. They follow the trend set by Swammerdam: a minimum of emblematic reflections, and an emphasis on the pluriformity of the world of insects. Instead of being framed with other symbolic naturalia and humanist mottos as Hoefnagel had presented them, they are represented from life, deprived of any context, so that the rendering refers solely to the external appearance of each insect.

One of the collectors in Holland was Nicolaes Witsen. This scholar and dignitary had been on friendly terms with Swammerdam. The latter used to call on the Witsens now and then, and Nicolaes returned the visits.²⁹⁰ It is likely that Swammerdam's remark that the nests of a particular sort of insect closely resembled 'houses in Muscovy' was based on information from the expert on Russia.²⁹¹ A letter to the Royal Society of 1671 shows that Witsen already had manuscripts of Swammerdam's microscopic observations of the bee and silkworm by that time.²⁹² Witsen, who owned a microscope and had a large collection of exotic insects, was also in contact with Van Leeuwenhoek.²⁹³ 'Nature is nowhere as complete as in its smallest parts', Witsen's friend Cuper

²⁸⁷ BL Ms Sloane 5273, 5274: 'A book containing severall sorts of insects from Europe, Asia, Africa, & America: painted from the life in their naturall colours. From the collection of Mr. Albert Seba of Amsterdam in two volumes. Anno MDCCXX-VII'.

²⁸⁸ BL Ms Sloane 4065, fol. 74.

²⁸⁹ BL Ms Sloane 4063, fol. 193.

²⁹⁰ Lindeboom, Letters, 54; Swammerdam, Miraculum naturae, 38.

²⁹¹ Swammerdam, *Bybel*, 570.

²⁹² CHO VIII, 396–397.

²⁹³ ABL XI, 238; GAA inv.no. 5059, nr. 180, fol. 193–194; ABL III, 54–67; Catalogus Kabinet Met Oost-Indische en andere konstwerken, 19; Catalogus kabinet, waarin ongemeene schoone hoorns...insecten, droog en in liquor, 31.

remarked after seeing the collection.²⁹⁴ Witsen shared his experiences and artefacts not only with Cuper but also with other members of the Republic of Letters. For instance, he favoured the Royal Society with an illustration of a curious insect from Ceylon:

I send you the figure or a draught of one insect sent mee from Ceylon which in that country is called *The Flying Leafe* since his *wings* are like a leafe growing on a tree. Theij tell mee that this insect comes forth from a small vermin engendred in the leafes of a certain tree, and that having received leggs fixith it self a good while to ye: branches and leafes, and encreasing becomes a flying animal provided with small wings like into those verry leafes.²⁹⁵

Thanks to his enormous international network, Witsen was sent specimens from all over the world. For instance, he had a collection of Surinamese insects that were probably displayed neatly by sort at different stages of their development.²⁹⁶

Another example is Maria Sibylla Merian, who left for Surinam in 1699 after she had seen the exotic insects in the cabinets 'of My Lord Mr Nicolaes Witsen...and of many others'.²⁹⁷ Her Surinamese drawings were published in 1705 as *Metamorphosis insectorum Surinamensis*. She avoided making detailed comments, 'since that has already been done at length by Mouffet, Goedaert, Swammerdam, Blankaart and others'.

The notion, popularised by Swammerdam, that God manifested himself in the everyday was taken very seriously by collectors. An excellent illustration of this is the collection of naturalia that the Delft physician and dignitary Henricus d'Acquet (1632–1709) started to form in 1654.²⁹⁸ He had precise drawings made of his possessions and in many cases he remarked on their particularities.²⁹⁹ For instance he had many exotic insects, mostly from Surinam and the East Indies. Yet probably more striking than the presence of a 'millipede from the Indies' is that

²⁹⁴ KB Ms 72 C 31, fol. 77.

²⁹⁵ BL Ms Sloane 4063, fol. 172. See also: Gebhard, Witsen II, 401.

²⁹⁶ Catalogus kabinet, waarin ongemeene schoone hoorns...insecten, droog en in liquor, 31.

²⁹⁷ Merian, Metamorphosis insectorum Surinamensis, 'Aan den Leezer'. On Merian see: Davis, Women on the Margins, 149–201; Wetengl ed., Merian; Reitsma, Merian and Daughters.

²⁹⁸ Jorink, "Alle bedenckelijcke curieusheden".

²⁹⁹ KIT RG 84, H., Ms d'Acquet, 'Opus magnificentissimum et unicum'.

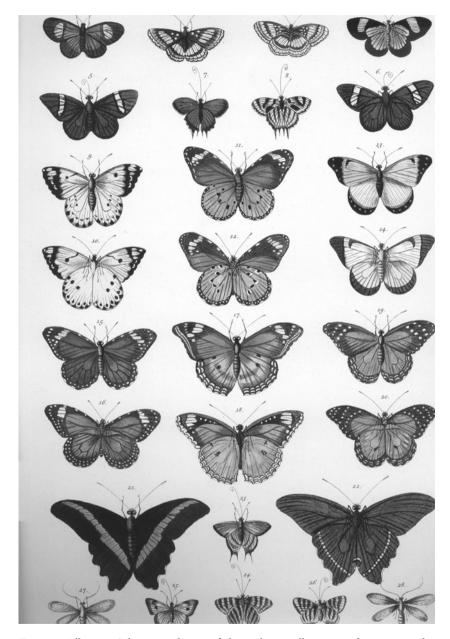


Fig. 39. Albertus Seba owned one of the richest collections of insects in the Dutch Republic. This is a page of his *Thesaurus* (1734), showing 28 different species of tropical insects (KB).

of a 'millipede from here'.³⁰⁰ Entirely in the spirit of Swammerdam and Van Leeuwenhoek (whom he knew personally), d'Acquet was particularly interested in the wonders that could be found on his doorstep. The manuscripts show drawings of Dutch water fleas that must have been made with the aid of a microscope.³⁰¹ We repeatedly come across the comment by d'Acquet that the insect in question was found 'near Noordwijk', 'on the beach', 'in Delft', or 'on the honeysuckle'.³⁰² There is the endearing comment on a butterfly 'from my garden' or a beetle 'from our water basin'.³⁰³ D'Acquet's collection does not seem to have been seen by many visitors apart from fellow collectors such as Schijnvoet, Ruysch and Vincent, but it is indicative of a changing sensibility.

The entomological preferences of Levinus Vincent were much more accessible to a broad public. 304 He owned one of the most famous cabinets in Europe, which received many visitors and was immortalised in a number of splendidly produced catalogues. 305 A spectacular part of Vincent's cabinet was dedicated to thousands of insects. 406 As he stated in the catalogue, they were classified 'according to the order and manner of Johannes Goedaert'. 307 The cabinets in which they were kept were divided into draws in which the different sorts were elegantly arranged by sort. Besides exotic insects, he also displayed scorpions as well as ordinary Dutch lice, ants and bees.

Vincent classified his insects on the basis of their external characteristics, which were much more important than emblematic references. The splendid variety of insects was an inexhaustible source of wonder to Vincent. No painter could equal the variation in pattern and colour:

For what first seemed copper suddenly turned gold, and while sky blue in the sun, turned green in the shade, and thus varies with the changing

³⁰⁰ Ibid. I, fol. 63.

³⁰¹ Ibid. I, fols 12, 31.

³⁰² *Ibid.* II, fols 46-47.

³⁰³ *Ibid.* I, fols 11, 12, 31; II, fols 45, 47.

³⁰⁴ On Vincent: Bergvelt and Kistemaker eds, Wereld binnen handbereik, 34–38, 225–228, 280–292.

³⁰⁵ Vincent, Wondertooneel der nature; Idem, Vervolg van het Wondertooneel der

³⁰⁶ Vincent, Wondertooneel der nature, 27.

³⁰⁷ Ibid., 27.

light of the day. Thus there is no creature so small that it does not manifest the wisdom of God.³⁰⁸

Besides the accessibility to the public, the large numbers and the enormous variety of sorts, this pious motif was an important characteristic of Vincent's collection. Referring to all the biblical and contemporary authorities, he repeated that God's almightiness could be seen most clearly in these creatures. One author was explicitly cited: 'Swammerdam says that the smallest creatures are no more lacking in dignity than the largest'. We also find a clear echo of Swammerdam's ideas in one of the encomia of Vincent's collection. The poet Johan Brandt wrote:

The great godhead is manifest in creatures small; Butterfly, fly, ant reveal its might to all.³¹⁰

Vincent's catalogues are riddled with similar remarks. God is here in the first instance the architect, the supreme artist, or the creator. Vincent's collection was deployed as an instrument in the physicotheological offensive in the eighteenth century. Atheists were called upon to hang their heads at the sight of God's wondrous works, in which the tiniest creatures in particular were seen as manifestations of his creative power. Vincent not only drove the point forcefully home himself, but also proudly referred to the comments of his visitors. 'At the sight of my curiosities and the observation of the many uncommon exotic insects or bloodless creatures', Vincent wrote, Frederick III of Prussia had exclaimed: 'I cannot believe that anyone who sees these things will not believe that there is a God'.³¹¹

5. Concluding remarks

In 1715 Nieuwentijt's *Regt gebruik* drew the attention of the 'godless' to the fact that the creator was pre-eminently manifest in the worm, mosquito, fly and cheese mite.³¹² After examining the anatomy of an insect, what atheist could still claim that there was no plan behind the

³⁰⁸ *Ibid.*, 12. See also Swammerdam, *Bybel*, 556.

³⁰⁹ Vincent, Vervolg van het Wondertooneel der natuur, 11.

³¹⁰ Brandt, 'Op het uitmuntend kabinet', in: Vincent, Wonder-tooneel, 20.

³¹¹ Vincent, Wonder-tooneel, A3/r.

³¹² Nieuwentijt, Regt gebruik, 560, 563.

creation? Even the most skilful grinder of lenses could not imitate the eye of an insect, which Van Leeuwenhoek had calculated to consist of eight thousand facets, 'in a large and handy glass'. God's greatness is visible all around us, Nieuwentijt claimed, and the minuscule anatomy of insects was no exception. He exhorted his readers to use the magnifying glass to conduct investigations and to follow the example of the collectors. Nieuwentijt himself did not devote much space to insects, not from lack of interest, but 'because there are entire books full of them'. J14

This did not mean that the theme had been exhausted. On the contrary, a veritable spate of works appeared after 1715 in which the omnipotence of the creator was demonstrated by means of the insects. First, of course, was Swammerdam's *Bybel der natuure* (1737–1738), but there were other works with eloquent titles too, such as Christiaan Sepp's massive *Beschouwing der wonderen Gods in de minstgeachtte schepzelen* (Consideration of the wonders of God in the humblest creatures; first volume 1762). Such works were not confined to Holland, although they were heavily indebted to Dutch scholars. An example is the *Insecto-theologia* (1738) by the German Friedrich Christian Lesser, which was largely based on the work of Goedaert, Swammerdam and Van Leeuwenhoek.³¹⁵

Within a century insects moved from the margin of reflections on the Book of Nature to the centre. Around 1600 only a few sorts, such as the bee, the ant and the butterfly, attracted the attention of scholars. A century later this situation had fundamentally changed. All kinds of insects, ranging from the familiar ones to a newly discovered Surinamese butterfly, and from the useful silkworm to the harmful Dutch bedbug, were now studied from all sides. The perspective had been radically widened. Thousands of sorts were now sketched or collected—a good start, since today there are some three million sorts known, of which one million are estimated to have been described scientifically. The descriptive trend that emerged in the seventeenth century was to a large extent nourished by the conviction that the anatomy of every creature, even the most common, was proof of the existence of the all-wise architect. In other words, insects were detached from their

³¹³ *Ibid.*, 565.

³¹⁴ Ibid., 563.

³¹⁵ Lesser, *Insecto-Theologia*; Idem, *De Sapientia*; see also Rösel von Rosenhof, *Insecten Belustigung*.

literary context and increasingly seen as manifestations of the underlying divine order in nature. This applied in principle to the whole of creation, but, the experts claimed, it was precisely in the minuscule structure of insects that the genius of the creator was revealed. We see here basically the same pattern as in the heated debate on comets: a shift from debates on the significance of the phenomena observed, to the underlying order and laws of nature.

It was particularly Johannes Goedaert and Johannes Swammerdam who were responsible, both in the Dutch Republic and in the rest of Europe, for the change in the attitude towards insects. The role of Goedaert is sometimes underestimated, but it is important to realise that he cleared the ground on which Swammerdam could plant his ideas. Goedaert considered the biblical and Plinian traditions to apply in principle to all sorts of insects, not only the canonical ones but also the common woodlouse and cockroach. Swammerdam was no doubt inspired by Goedaert's immensely popular *Metamorphosis*, but it is in Swammerdam that we can see the transition from symbolic reflections to the argument from design. Swammerdam's investigations led to the conclusion that the symbolic interpretation of insects was incompatible with the processes that actually took place in nature. While the transition from caterpillar to butterfly was traditionally seen as the result of metamorphosis and regarded as an allegory of the resurrection, Swammerdam demonstrated that every part of the butterfly was already present in the caterpillar. The allegory was thus untenable. Everything in creation, including the generation of insects, was subject to the same laws of nature. Symbolic preferences were irrelevant: God was just as manifest in the anatomy of the elephant as in that of the bee or louse.

Swammerdam gave the notion of the Book of Nature a new content. This book should not be studied on the basis of the canon. The Bible of Nature was so clear and transparent that, even for those who disregarded or did not know the Holy Scripture, it still provided the incontrovertible proof of the creative power of the divine architect.

It is tempting to attribute Swammerdam's redefinition of the notion of the Book of Nature exclusively to developments in the natural sciences, in this case the use of the microscope. It is generally assumed that this instrument was not used systematically until after the appearance of Hooke's *Micrographia* in 1665, and that this almost automatically led to the physico-theological and insecto-theological treatises

of the eighteenth century. Closer inspection, however, shows that the situation was much more complicated. The fact is often overlooked that a group of Dutch humanists, including Constantijn Huygens, Andreas Colvius and Jacob Westerbaen, followed the Plinian dictum rerum natura nusquam magis quam in minimis tota sit and resorted to the microscope already between 1640 and 1650. Westerbaen's didactic poem Ockenburgh contains one of the first known microscopic descriptions of insects in history. This circle also shared a programmatic principle, though it was primarily aimed less at making discoveries than at evoking wonder. They examined all kinds of Dutch insects, praised God's greatness even in these smallest letters from the Book of Nature, but also wondered whether the classics had been right in all respects.

Swammerdam operated in the same spirit. He made hardly any use of the microscope for his pioneering Historia. Although he was a talented observer, Swammerdam was primarily guided by a prioris of a philosophical and theological kind. One of these was that everything in nature, including the generation of insects, obeys God's laws. A second was that the almightiness of the creator is most manifest in his tiniest and most everyday works, even to the unbelievers. The first of these ideas shows a Cartesian influence; the second was a commonplace since Cicero and Pliny. It is thus partly against this background of classical themes, religious motifs and growing scepticism that we should regard Swammerdam's magisterial oeuvre, and not just see it as the logical result of the invention of an optical device or of the private obsessions of a tormented personality. On the one hand, Swammerdam's redefinition of the Book of Nature was in line with traditional natural theology. On the other hand, his conviction that God's works obeyed underlying regularities but were basically impenetrable was to lead to the physico-theology of the eighteenth century.

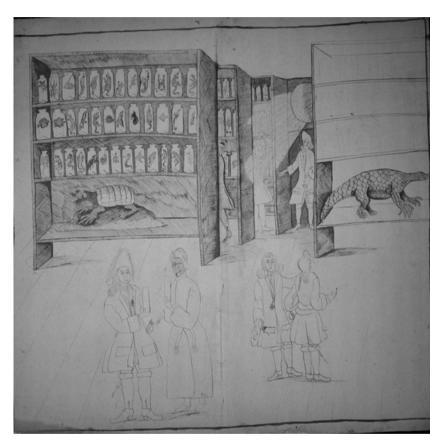


Fig. 40. Levinus Vincent owned one of the best known collections of curiosities of the Dutch Republic. This drawing was made by Jan Velten, who visited Vincent in 1701 (Artis bibliotheek).

CHAPTER FIVE

COLLECTIONS OF CURIOSITIES: 'A BOOK IN WHICH GOD HAS GLORIOUSLY DESCRIBED HIMSELF'

1. Introduction

'It is your own fault that I have not written for such a long time', Constantijn Huygens wrote to Caspar Barlaeus in 1630. 'You send me so many of your things to examine that I spend all my free time on that'. Huygens is here referring to the curiosities that Barlaeus gave him. The humanist was the proud possessor of a large collection of *naturalia* in which, as he lyrically emphasised in his correspondence with Huygens, he could contemplate divine omnipotence, wisdom and goodness. Now and then he sent Huygens some small object so that he could share his amazement. It is no surprise that Huygens had difficulty in finding the time to examine all these curiosities, for as he confessed to Barlaeus: 'I have collected many such things myself, which are kept in no less than 900 little boxes'.²

The fascination with collecting rarities is one of the most striking characteristics of early modern learned culture.³ From Naples to Uppsala, from Dublin to St Petersburg, large collections were built up by princes, universities and 'amateurs'. A variety of sources reveal an astonishing diversity of objects. Mummies, misshapen animals, birds of paradise, the bones of giants, kayaks, Chinese texts, unicorn horns, Amerindian feathered ornaments, scientific instruments, armadillos, Roman coins, insects and countless other rarities were apparently haphazardly brought together in a single room.

The Netherlands was not exempt from the fashion of collecting. Bernardus Paludanus, the town physician of Enkhuizen, was the first to build a substantial collection at the end of the sixteenth century,

¹ BCH I, 272-273.

² BCH I, 272.

³ Impey and MacGregor eds, Origins of Museums; Pomian, Collectioneurs, amateurs et curieux; Kenseth ed., Age of the Marvelous; Grote ed., Macrocosmos in Microcosmo; Bergvelt, Meijers and Rijnders eds, Kabinetten, gallerijen en musea; MacGregor, Curiosity and Enlightenment.

and many were to follow. The expanding economy, the flood of unfamiliar artefacts from the newly discovered trade regions in East and West, and the flourishing cultural life were all factors that contributed to the fact that Dutch collections soon came to rank among the most prominent in Europe.

One question deserves particular attention in the present study: did religious motives play a role in the building up and interpretation of these collections? In other words, were the highly diverse artefacts regarded as 'letters' from the seventeenth-century perspective, and can these collections as a whole be related to 'the wonderful book of God', the Book of Nature? This question has been touched on incidentally in the previous literature without receiving an unambiguous answer.⁵ It is not my intention to pronounce on the religious motives of the Dutch collectors. There were collectors who confined themselves to collecting coins, or for whom the collection was primarily a status symbol or a good investment.

This chapter focuses on a group of scholars for whom the case can be argued that their collecting activities have to be considered in the light of the Book of Nature. There are many striking lateral connections between the contents of early modern collections of curiosities and the way in which the study of emblems, natural history, natural philosophy, exegesis and other activities were practised. It is no accident that those under consideration here are mainly theologians, humanist scholars and other *amateurs* who took an interest both in the Bible and in nature for religious reasons. An example is the virtually unknown collection of Caspar Barlaeus, which seems to have consisted mainly of shells.⁶ Another illustration is provided by the poet Petrus Hondius. There was a collection of 'all kinds of rarities' in his country residence 'Moufe-schans'.⁷ This minister regarded globes, maps, exotic plants, shells, marine creatures, stuffed birds and all kinds

⁴ On the Dutch culture of collecting see: Bergvelt and Kistemaker eds, Wereld binnen handbereik; Engel, Alphabetical List; second expanded edition: Smit ed., Hendrik Engel's Alphabetical list; Van de Roemer, 'Neat Nature'; Van den Boogert ed., Rembrandts schatkamer; Bergvelt, Jonker and Wiechmann eds, Schatten in Delft; Cook, Matters of Exchange, 82–225, 267–339 and passim.

⁵ Van Gelder, 'De wereld binnen handbereik'; Van der Waals, 'Wankelend wereldbeeld'; Van Berkel, 'Citaten uit het boek der natuur'; Idem, *Citaten*, 85–110; Van de Roemer, 'God en het rariteitenkabinet'.

⁶ BCH I, 271; Notae quotidianae van Aernout van Buchel, 96-97; OAH inv.nr 2059, fol. 81/v.

⁷ Hondius, Moufe-schans, 429–436.

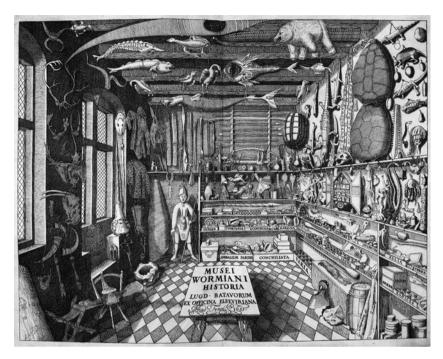


Fig. 41. Dutch cabinets of curiosities were, curiously enough, rarely depicted. The frontispiece of Ole Worms' *Musaei Wormianum* (1655) might give us a clue what these cabinets may have looked like (KB).

of monstrosities as manifestations of divine omnipotence. The garden, curiosities and library in which the latter were housed were inextricably interlinked. After a description of the estate and curiosities in the 16,200 lines of the poem *Moufe-schans*, Hondius compared the collection with a book written by God himself.⁸

Hondius' words are indicative of the spiritual context in which many collectors operated. Other exponents of this tendency were the famous Paludanus, the less famous scholars Brinck, Colvius and De Laet, the physicians Swammerdam and Ruysch, and the dignitary and *amateur* Witsen. They were scholars—and this is no coincidence—who were all closely connected with the academic milieu of Leiden, where both natural inquiry and philology had emerged. It is this intellectual context in which the connection between books, languages and things, and

⁸ Ibid., 533.

between reflections on religion and natural philosophy, played such a prominent role. Each of these scholars created a collection of *naturalia* and regarded them from his own particular point of view as a tribute to God. Whether explicit or not, this was a major a priori.

Musaeum, library, microcosm

It would be anachronistic to regard the early modern collections as direct precursors of today's museums. The latter are characterised by the concentration of objects of a similar kind within a closed building. The early modern collections, on the other hand, were very heterogeneous as regards both location and composition. They were based on the idea of the Greek *mouseion*, a place dedicated to the Muses for study, inspiration and contemplation. For Pliny that could be an idyllic part of the natural surroundings, a place dear to the Muses. However, it could also be a closed space, such as the famous library of Alexandria, which was regarded as a signal example for all forms of *scientia* in the Renaissance. The term *musaeum* did not have purely spatial connotations, but was a broad philosophical concept, as the number of synonyms in use in the early modern period shows: *arcus*, *theatrum*, *microcosmos*, *bibliotheca*, *thesaurus*, *pandechion*, *studio*, *oratorio*, *laboratorio*, *archivio*, *orbis in domo*, *Wunderkammer*. In

One of the roots of the early modern collections was the study (*studiolo* or *scrittoio*). Humanists surrounded themselves not only with classical texts, but increasingly also with artefacts such as ancient coins. ¹² The emphasis was initially on the texts: Aristotle, Dioscorides, Theophrastus, Galen, Pliny, and of course the Holy Scripture. The objects served primarily the purposes of illustration and meditation. What was described by the writers of antiquity could be sought in nature, and much research went into the question of whether a particular object matched the text. ¹³ The books and objects in studies were intended as a comprehensive system of knowledge. There was no sharp dividing line between words, images and objects. 'If Nature', Findlen

⁹ Findlen, 'The Museum'.

¹⁰ Pliny, Naturalis historia XVI, xx.

¹¹ Findlen, 'Museum', 59; Lugli, *Naturalia et mirabilia*, 55–79. See also: Neickel, *Museographia*, 1–2; 405–411.

¹² Momigliano, 'Ancient History and the Antiquarian'; Leibenwein, *Studiolo*.

¹³ Dannenfeldt, 'Medieval Herbalism'; Reeds, 'Rennaissance Botany'; Findlen, *Possessing Nature*, 48–144.

writes, 'was the text from which the Renaissance naturalists chose their materials, then their museums were literally the "con-texts". 14

The search for texts and objects was essentially a search for comprehensive knowledge of God's creation, and was thus by definition religiously inspired. It is no coincidence that in this connection sixteenth-century scholars did not appeal exclusively to the classical idea of the *musaeum*, but also harked back to Paradise, the Ark of Noah, or the Temple of Solomon. The texts and *naturalia* to be found in the libraries were also the manifestations of a search for the Adamic knowledge of nature that had been lost. This is the context in which the scholarly fascination with *naturalia* and etymology has to be seen: both inquiries ultimately had their roots in the Garden of Eden. It is therefore impossible to distinguish between sacred and profane motives in early modern collections.

Curiosities, whether displayed in churches, courts, studios or university anatomical theatres, were intended to provoke wonder. ¹⁶ That could be done by a whole range of objects: skilfully made automata, contemporary paintings, antiquities, coins, inscriptions, and countless *naturalia*. In principle, everything could provoke wonder, but since the natural was inconspicuous and miracles were rare, many collectors followed in Pliny's footsteps and focused on the unusual and rare (*curiosités, mirabilia*). ¹⁷ It was in borderline cases such as gigantic radishes, monstrosities, anthropomorphic plants and shells inscribed with mysterious letters that God's creative force was revealed most plainly. Daston therefore aptly describes cabinets of curiosities as 'museums of the preternatural'. ¹⁸

The idea of the *musaeum* was thus not a precisely circumscribed concept, but one with numerous connotations for which there was a series of synonyms. The sixteenth-century collections, as complex as the world itself, could be interpreted in different ways: in terms of Neo-Platonism, mnemotechnic systems, *artificialia* versus *naturalia*, the four elements, the doctrine of signatures or the metaphor of the

¹⁴ Findlen, 'Museum', 64.

¹⁵ Schulz, 'Notes', 209; Bennett and Mandelbrote, *The Garden, The Ark, The Tower, The Temple.*

¹⁶ Kenseth, Age of the Marvelous, 25-59; Daston, 'Neugierde'; Whitaker, 'Culture of Curiosity'.

¹⁷ Findlen, 'Jokes of Nature'; Daston and Park, Wonders and the Order of Nature, 255-302.

¹⁸ Daston, 'Marvelous Facts', 106.

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Fig. 42. One of the origins of the cabinets of curiosities was the *bibliotheca*. This illustration taken from Ferrante Imperatio, *Dell'Historia naturale* (1599) shows the inextricable bond between objects and books, between *res* and *verba* (KB).

world as a book, theatre or microcosm. The meaning of an object is not an immanent given, but depends on the constantly changing mental and temporal context.¹⁹ The objects collected by sixteenth-century scholars had an infinite number of connotations and were entangled in a web of associations and allusions. In other words, the sixteenth-century collections were intertextual and even partly metatextual, narrative, symbolic, and in need of exegesis. Assuming that all objects in the visible world are manifestations of God's unlimited creative power, the scholarly collectors felt that they could survey the whole world and the whole of history. There was no boundary between the geographical and temporal dimensions of God's creation. Time and space disappeared. This flowing transition between words, images and objects, between here and there, and between present and past, is perhaps the

¹⁹ Pomian, 'Entre l'invisible et le visible'.

most important characteristic of the early modern *musaeum*. The collections in the Netherlands are a good illustration of this.

Italian examples

The collecting fashion paid little heed to national boundaries in early modern Europe. An extremely important impulse for the young Dutch Republic came from the collections of the Italian universities and several Italian collectors. An illustrative example is the Neapolitan apothecary Ferrante Imperato (1550–1631), who described his impressive collection in his widely read *Dell'historia naturale* (1599). The attractive illustrations must have helped the work to attain its exemplary function. Considerable influence was also exerted by the North Italian universities, where the teaching of medicine had been backed up by anatomical theatres, botanical gardens and collections of curiosities since the middle of the sixteenth century.

The teaching of medicine did not get off the ground in the Dutch Republic until the foundation of Leiden University in 1575. Almost every member of the first generation of Leiden professors of medicine had studied in Padua.²¹ Many of them visited neighbouring Bologna during their period of study, where in 1568 the exuberant professor of medicine Ulisse Aldrovandi started a botanical garden and a collection of *naturalia* that was soon to be without parallel. Until the middle of the seventeenth century, Aldrovandi's publications were the starting point for much natural historical inquiry, and his collection was famous too.²² Contemporaries regarded him as a second Pliny whose ever expanding collection brought the wonders of the world within reach of hand and eye. Information reached Aldrovandi from every corner of Europe and the other continents, which he catalogued and complemented with his exhaustive knowledge of the classics. Certain knowledge of each artefact required not only a description of its external characteristics but also a survey of its entire history, including all the biblical and classical references, symbolism, etc. As Findlen justifiably claims: 'For Aldrovandi, the encyclopedia was located neither in the text nor in the object alone: rather it was the dialectic between res

²⁰ Olmi, *l'inventario del' mondo*; Garbari and Tongiorgi Tomasi eds, *Giardino dei Semplici*; Findlen, *Possessing Nature*.

²¹ De Ridder-Symoens, 'Italian and Dutch Universities'.

²² Findlen, Possessing Nature, passim; Olmi, L'inventario del mondo, 21-118.

and verba that fully defined the universality of his project'.23 Aldrovandi's fascination with etymology and hieroglyphics has to be seen in the light of the humanist search for the lost language of Paradise, the language with which Adam named everything in accordance with its nature.24

This work published during and after Aldrovandi's lifetime and collected in the monumental Opera omnia (1599-1668), as well as the vast quantity of tidily arranged manuscripts in his archive, reveal a boundless confidence in the possibility of obtaining a picture of the whole visible world and embedding it in a system of cross-references. A proper appreciation of Aldrovandi also has to take into account the explicit religious dimension of his work. This was expressed not only in allegorical explanations of each item and in pious exhortations to conduct natural inquiry, but also in the collection of all the naturalia mentioned in the Bible, from locusts to Leviathan and from myrrh to the blood of Christ.²⁵ It is probably no coincidence that we find the same preoccupation soon afterwards in the Dutch Republic in the cases of Paludanus and the anatomical theatre in Leiden. More generally, the fascination of the Catholic Aldrovandi with the determination of biblical naturalia met with a warm welcome from a tendency that was particularly prominent among Protestant theologians such as Danaeus and Franzius.

Aldrovandi came a long way in his attempts to bring the world as it was known at the time within reach. The great scholar obviously depended on assistants too. One of these was Aelius Everhardus Vorstius (1565-1625) from Roermond, whom Aldrovandi described as 'my very learned student and excellent assistant'.26 Vorstius was appointed professor of medicine in Leiden in 1598. He had left for Italy to study in Padua in 1586, and surfaced in Bologna in 1589, where he praised Aldrovandi's musaeum in an eloquent epigram.²⁷ In the following years Vorstius assisted Aldrovandi in making excerpts

²³ Findlen, Possessing Nature, 65.

Ashworth, 'Natural History', 314; Bono, *Word of God*, 123–124.

See the following manuscripts in BUB, Fondo Aldrovandi: 48 'Methodus theatri biblici'; 49 'Index theatri biblici'; 50 'Lexicon latino-hebraicum et syro-chaldaicum'; 51 'De cruce'; 52 'Index de cruce'; 53 'Index rerum naturalium Sacrae Scripturae'; 54 'Theatrum biblicum naturale'.

²⁶ BUB, Fondo Aldrovandi 110, s.p.

²⁷ BUB, Fondo Aldrovandi 21 IV, fol. 5/r: 'In Diem festum Natalibus magni Ulyssis Aldrovandi'.

from classical and contemporary literature, visiting and describing the collections of other collectors, cataloguing all the information, and keeping a register of visitors, a task which kept Aldrovandi's assistants busy. His *musaeum* had an enormous influence on the way in which natural history was practised all over Europe. His collection was one of the main attractions of North Italy and naturally attracted many professors and students as well as a long procession of princes, prelates and other dignitaries. A considerable number of them were from the Low Countries, including a certain 'Doctor Bernardus Paludanus, excellent investigator of nature'.²⁸

2. Collections of curiosities in the Netherlands down to ca. 1660

The European collectors were well informed about one another's activities and honoured one another with letters, gifts, and, if possible, a visit.²⁹ There was little for them to see in the war-ridden Northern Netherlands in the last decades of the sixteenth century. The attitude of the indefatigable Aldrovandi, who meticulously kept an archive arranged by region of the mirabilia that were to be found there, is illustrative. At first he showed little interest in Holland. There were hardly any curiosities there, just a lot of water (molte d'acqua).30 The only item of interest was the occasional beached whale; Aldrovandi's collection included a whale jaw and penis.³¹ In the 1590s, however, his attitude changed dramatically and he began to follow events in Holland with great interest. An important university had been established there; ships with the most exotic wares were arriving there from East and West, Africa and the polar regions; and there was his friend Paludanus, who had a 'beautiful studio of naturalia' (bellisimo studio di cose naturali) in the town of Enkhuizen which was plied by those same ships.³² Aldrovandi made painstaking notes on all the curiosities that were described in the Itinerario (1596) written by Paludanus'

²⁸ BUB, Fondo Aldrovandi 41, fol. 110.

²⁹ Olmi, "Molti amici i varii luoghi"; 3–31; Van Gelder, 'Liefhebbers en geleerde luiden'; Egmond, 'Clusius and Friends'.

³⁰ BUB, Fondo Aldrovandi 137 I, fol. 39.

³¹ BUB, Fondo Aldrovandi 143 XII, fol. 139.

³² BUB, Fondo Aldrovandi 143 XIV, fol. 47.

friend Jan Huygen van Linschoten.³³ When Vorstius returned to the Low Countries for good in 1596 after his stay in Italy, he was asked to deliver a letter to Aldrovandi's colleague Clusius and to report on all the curiosities that he would see in Leiden and Enkhuizen.³⁴ In spite of all that he had seen in Italy, Vorstius wrote to Aldrovandi that the recently established botanical garden in Leiden was 'truly beautiful and very well furnished with rare plants', while Paludanus was the owner of an impressive collection of 'minerals, plants, aquatic and terrestrial animals...and a large quantity of exotic things from the new Indies'.³⁵

The change in Aldrovandi's attitude is typical of the explosive growth of international interest in the Dutch collections. From the period of Paludanus (late sixteenth century) to that of Vincent and Seba (early eighteenth century) the Dutch Republic contained several collections that attracted a good deal of international interest.³⁶ It is significant that there was no longer a one-way traffic from the Low Countries to Italy; the Florentine Prince Cosimo de' Medici undertook two journeys to the Dutch Republic in 1667–1669 and visited the collections of Swammerdam and Ruysch.³⁷ In 1714, by which time the prince had become a Grand Duke, he even sent a special legate to the 'heretical Protestants' to study the latest developments in collecting.³⁸ He waxed lyrical in the report of his visits to the cabinets of Ruysch, Vincent and others. Many other foreign visitors expressed their admiration for what they saw and often noted the pious ideas that came into their minds.

Bernardus Paludanus

The first large-scale collection in Holland was immediately one of European renown: that of Bernardus Paludanus (1550–1633).³⁹ He

³³ BUB, Fondo Aldrovandi 136 XXVIII, fols 11–56 and fols 189–279; 136 XXX, fols 187–303; 136 XXXI fols 21–59.

³⁴ The letter of Aldrovandi to Clusius was, according to a note *in dorso*, delivered on 20 June 1596, UBL Ms Vulc. 101.

³⁵ BUB, Fondo Aldrovandi 136 XXV, fol. 133.

³⁶ Van Gelder, 'Noordnederlandse verzamelaars'; Idem, 'Liefhebbers en geleerde luiden'; Cook, *Matters of Exchange*, 82–225, 267–339.

³⁷ Hoogewerff, *De twee reizen van Cosimo de' Medici*; Van Veen, 'Cosimo de' Medici's reis'.

Travel rapport of Jacopo Guiducci in ASF, Misc.Medm 92 ins.1; quote fol. 70/r.

³⁹ On Paludanus: Hunger, 'Bernardus Paludanus'; Van Gelder, 'Paradijsvogels in Enkhuizen'; Cook, *Matters of Exchange*, 115–130.

received visitors from every corner of Europe and numerous sources attest to the wondrous objects that could be seen in Enkhuizen.⁴⁰ Like those of his contemporaries, Paludanus' cabinet was not open to the public, but was a private domain to which only persons of prestige were admitted. What Paludanus himself modestly referred to as his 'conclave' was admirably placed in the classical tradition by Hugo Grotius, whose eulogy of Paludanus' collection is a plethora of classical synonyms for the *musaeum*:

Treasury and compendium of the whole world Ark of the universe, sacred storehouse of nature.⁴¹

Paludanus was born in Steenwijk as Berent ten Broeke in 1550. He set out for Italy in 1577, passing through Vienna (where he met Clusius) on his way to Padua. He began collecting all kinds of *naturalia* on the journey. After arriving in Padua in 1578, he enrolled as a student of medicine and graduated in 1580. While still a student he travelled to the Middle East for several months in 1578, where he visited Bethlehem, Jerusalem, Alexandria, Lower Egypt and other places, as well as collecting relics, Egyptian objects, stones and seeds. Travel to the mysterious land of Egypt was unusual at this time. He also visited the famous collections of Ferrante Imperato in Naples and Ulisse Aldrovandi in Bologna, both of whom signed Paludanus' *album amicorum*. Aldrovandi's collection must have particularly impressed him. In later life he referred to Aldrovandi as his mentor (*praeceptor*).

After returning to the Netherlands, Paludanus established himself as a physician in Zwolle in 1581, where he became a Protestant. Five years later he became town physician in the bustling port of Enkhuizen, where he created his own botanical garden and rapidly built up his collection of curiosities. He soon achieved a great reputation; in 1591 the curators of Leiden University tried to get Paludanus to lay out the botanical garden there and to include his complete collection of *naturalia*. ⁴⁶ Paludanus declined the offer, but did send some sketches for the planned garden, which clearly betray the influence of Padua

⁴⁰ Van Gelder, 'Liefhebbers en geleerde luiden', 263–266.

⁴¹ KBK Ms K.S. 3467,8, fol. 3/v; Grotius, Poemata, 276.

⁴² Hunger, L'Ecluse II, 368; Van Wijk, 'Het album amicorum'.

⁴³ Smits, De Verenigde Nederlanden op zoek naar het oude Egypte, 17.

⁴⁴ KB Ms 133 M 63, fols 248/v and 249/r.

⁴⁵ BLF Ms Ashburn, 128.10, fol. 10/r.

⁴⁶ Molhuysen, Bronnen I, 180*.

and Pisa.⁴⁷ Paludanus maintained cordial relations with the academic world of Leiden.⁴⁸ He was a friend of Clusius and was on very good terms with Scaliger, the brightest star in the Leiden firmament.⁴⁹ The following account by a visitor to Paludanus in 1594 speaks volumes:

The other day I visited Paludanus... He showed me his collection, which had such varied and numerous items that I scarcely believed they existed in nature. Nature herself seems to have moved into his house, entire and unmutilated, and there is nothing written down in books that he cannot present to our eyes. That is why the great man Joseph Scaliger gave all his rarities (which were both numerous and spectacular) to Paludanus, saying, 'Here are your things, which I have possessed unjustly'. ⁵⁰

Paludanus' fame extended further. For instance, he was in close contact with the physician, emblematist and collector Joachim Camerarius II, the antiquarian William Camden (1551–1623), and the cosmographer Abraham Ortelius (1527–1598).⁵¹ The friendship between Paludanus and his fellow townsman Jan Huygen van Linschoten was also of great importance. The explorer collected all kinds of curiosities for Paludanus on his travels, while Paludanus added annotations to Linschoten's account of his years in Portuguese Goa, the Itinerario ofte Reijsboek (1596). 52 As Cook rightly points out, Paludanus 'helped so much that he was virtually co-author of Linschoten's *Itinerario*, turning the work from a personal account of travels into a description of the East Indies in line with the best new work on natural history'. 53 Thanks to the immensely popular Itinerario, a wide public could make the acquaintance of numerous new peoples, animals, plants and stones. According to Linschoten, the creation proved to be a treasure chamber in which God in his wisdom 'has presented us with much to cause us to wonder'.54 Some of those objects were illustrated in the *Itinerario* and described by Paludanus, often with the significant mention of the fact that the rarity in question could be seen in Paludanus' house.

⁴⁷ Terwen-Dionisius, 'De eerste ontwerpen voor de Leidse Hortus'.

⁴⁸ Egmond, 'Een mislukte benoeming'.

⁴⁹ Berendts, 'Carolus Clusius and Bernardus Paludanus'.

⁵⁰ Quoted in Ogilvie, Science of Describing, 41.

⁵¹ UBL BPL UB 2596 facs A 15 2b; BL Add Ms 36,294, fols 23–25; Tracy ed., *True Ocean Found*; Hessels ed., *Epistulae Ortellianae*.

⁵² Van Gelder, 'Paradijsvogels in Enkhuizen'; Pos 'So weetmen wat te vertellen als men oudt is'.

⁵³ Cook, Matters of Exchange, 124.

⁵⁴ Linschoten, *Itinerario* I, xlii-xliii.

Paludanus' annotations to the *Itinerario* offer us a glimpse of the contents of his collection, while the various manuscript catalogues that he produced provide a fuller picture.⁵⁵ The fullest of these, the bilingual 'Catalogus sive descriptio rerum naturalium et artificialium / Algemeijn register', was compiled in 1617. Besides a very detailed list, the manuscript also provides background information about the formation of the collection and, almost in passing, clues to the interpretation of diverse curiosities. Of the roughly 16,500 objects described in that catalogue there were 300 ethnographic objects from East and West, 150 writing materials, 160 weapons, 8,700 marine objects, 130 antiquities, 230 parts of birds and other animals, 3 mummies (which were a great rarity at the time), 250 relics and biblical *naturalia*, 1,900 fruits and seeds, 3,400 minerals, stones and ores, and 1,300 coins.⁵⁶

Paludanus kept almost all his treasures in cabinets which were carefully arranged per item. There was no hard and fast boundary between the categories. For instance, there was a seamless transition from the works of art and utilities from the East and West Indies to writing materials, including Chinese sealing wax and ancient writing on papyrus, before moving on logically via the section weapons—pipes made of bones 'which the American cannibals have gnawed' and the sword of a swordfish—to the large collection of marine objects.⁵⁷ This category naturally included not only the requisite parts of whales but also the teeth of 'a creature that John called Behemoth', a collection of some 4,000 exotic shells, and numerous corals and dried polyps.⁵⁸ It was only a small step from here to the cabinets with dried plants, the preserved parts of animals, and minerals. At the end of a tour of Paludanus' musaeum the visitor could see a large quantity of ores and tooled precious metals before concluding the visit with the coin collection.

When it comes to interpreting Paludanus' collection, it is important to bear in mind that a single, comprehensive interpretation is impossible. Of course, utilitarian motives played a role, but it would be oversimplistic to argue that the physician's collection was put together

⁵⁵ A brief description in: Rathgeben and Schickhart, *Warhaffte Beschreibung zweyer*. Inventories by Paludanus in BIC Ms 1821 fols 334–341 (which I have not seen); KBK Ms K.S. 3467,8 and BLF Ms Ashburn. 128.10.

⁵⁶ All of these totals are approximate.

⁵⁷ KBK Ms 3467,8, fol. 22/v-fol. 23/r.

⁵⁸ Ibid. fol. 30/r.

for scientific purposes. It is more of a collection based on different, though often related ideas. The fact that many items could be used for medicinal purposes, for instance, cannot be detached from metaphysical views, emblematic meanings and, above all, biblical references, as a number of examples will make clear. For instance, Paludanus owned three mummies. As ground mummy was traditionally regarded as an extremely potent cure for all kinds of ills, it has been suggested that Paludanus was interested in it for medical reasons.⁵⁹ However, mummies were also very appealing references to the arcane wisdom of the ancient Egyptians, which is one of the reasons why they were considered to be a panacea. 60 Egypt was the biblical land of the pharaohs, magicians and mysteries, the kingdom of the pyramids, the enigmatic obelisks and the fascinating hieroglyphs.⁶¹ Partly under the influence of the Corpus Hermeticum, it was widely assumed that ancient Egypt was the source of all knowledge and that both Moses and Plato had been among its pupils.62 The Old Testament contained full descriptions of rituals and customs that Christians viewed ambivalently, such as the concluding verse of the book of Genesis: 'So Joseph died, being an hundred and ten years old: and they embalmed him, and he was put in a coffin in Egypt'. This is part of the background against which we should view Paludanus' mummies: as allusions to the prisca theologia. The objects were not mute, but immediately rendered the divine history of salvation visible and tangible. Paludanus therefore explicitly referred to biblical passages on the techniques of embalming in his catalogues.⁶³ Mummies were extremely rare at the time those of Paludanus were shipped to Holland with the greatest possible difficulty—and attracted a good deal of attention. It is indicative that Scaliger visited Paludanus immediately upon arriving in the Dutch Republic in 1593 and recorded his astonishment at the largest of the

⁵⁹ See for example Smits, *De Verenigde Nederlanden op zoek naar het oude Egypte*, 19.

Dannenfelt, 'Egyptian Mummy'.

Dannenfelt, 'Egypt and Egyptian Antiquities'; Iversen, *Myth of Egypt*; Shalev, 'Measurer of all Things'.

⁶² Walker, Ancient theology; Assmann, Moses the Egyptian; Curran, Grafton, Long and Weiss, Obelisk.

⁶³ KBK Ms K.S. 3467,8 fol. 63/r: 'Von die manijre disser balsummunge kan man lesen das letste capittel ins eerste buch Moysi dar aldus steht: Porro Joseph medicis suis servis mandavit ut aromatibus condirent patrem suum et aromatibus condierunt medici Israelem et exacti sunt et quadraginta dies, nam hic implentur dies eorum qui aromatibus condiuntur et luxerunt eum Aegyptii septuaginta dies'. See also BLF Ms Ashburn. 128.10, fol. 14/v.

three mummies: 'the body of an Egyptian who was buried more than 3,000 years ago. It is a genuine antiquity'.⁶⁴ For the authority who had calculated that the earth had been created in 3950 BC, the sight of such an ancient relic must have been a real sensation.⁶⁵ In terms of Scaliger's chronology, the mummy dated from the years of Abraham's sojourn in Egypt (*Genesis* 12:10)!⁶⁶ It is no wonder that Hugo Grotius was also impressed. There is no doubt that he considered the mummies in the light of the Bible, and was later to write to Paludanus that these 'wonders of Egypt' had made a profound impression on him.⁶⁷

In principle the same is true of unicorn horns as of mummies. They too were attributed a medicinal effect, but that was not the only reason to hunt the unicorn.68 The horn that could be seen in many cabinets referred to the unicorn, to a series of religious ideas, to the Physiologus, and, it was assumed, to various passages in the Old Testament. The original Hebrew text of the Old Testament refers to the animal re'em in eight places. 69 This was translated as monokèrotos (lit. 'one-horned') in the Septuagint. The Dutch translation in use by the Reformed Church, the Statenvertaling, rendered this with the Dutch word for unicorn (eenhoorn). The biblical passages in question generated an enormous corpus of texts, images and ideas. European scholars speculated about the unicorn until late in the early modern period, and evidence that seemed to attest to the existence of the creature was welcomed in churches and cabinets. What were supposed to be unicorn horns at the time were shown to be narwhal tusks later in the seventeenth century.70 For Paludanus and his contemporaries, however, the unicorn was a genuine beast that was the source of emblematic representations; for instance, the unicorn played a prominent role in the Symbola et emblemata by Paludanus' friend Camerarius.71 It is significant that, although Paludanus was not able to get his hands on a horn of this kind, he did manage to obtain the impression of

⁶⁴ KB Ms 133 M 63, fol. 29/r; Scaligerana, Thuana, Pithoeana et Colomesiana II, 484.

⁶⁵ Grafton, 'Rise and Fall'; Idem, Scaliger II.

⁶⁶ Scaliger, De emendatione temporum...opus novum, 350-351.

⁶⁷ Rogge, 'Schriftelijke nalatenschap'.

⁶⁸ Cf. Schnapper, Le géant, la licorne, la tulipe, 87-94.

⁶⁹ Cf. Shepard, Lore of the Unicorn; Gerritsen and Jonker, De eenhoorn en de geleerden; Schnapp, 'The Pre-Adamites'.

⁷⁰ Shepard, Lore of the Unicorn, 155-212.

⁷¹ Camerarius, Symbola et emblemata IV, 20-22.



Fig. 43. In Paludanus' *album amicorum*, not only visitors put their names and a motto, but emblems were collected as well (KB).

such a horn in stone and 'a white bolus...mark of a unicorn'.⁷² That was apparently a good substitute for the horn itself, just as the horn referred to the much sought after animal, which in turn seemed to refer to the textual tradition.

That textual context can also be seen from the fact that Paludanus had a large collection of stones that referred to a single text in particular: Holy Scripture. The catalogue of 1617 ranges over stones from the mountains of Sinai, Calvary, Cedron and Tabor, red earth from Damascus with the colour of Adam's flesh, stones from the cave 'where St John did penitence', and 'brimstone from Sodom and Gomorrah in which those cities were burnt'. Paludanus had some 230 biblical *naturalia* of this kind, such as the tooth of Behemoth, an unspecified part of Leviathan, locusts, the fruit of the locust or carob tree (also known as St John's bread) 'that yields the honey that St John ate in the wilderness', Egyptian papyri, cedar wood from Mount Lebanon, myrrh, a stone from the Temple of Solomon, earth from the Jordan

 $^{^{72}\,}$ KBK Ms K.S. 3467,8, fol. 60/v, my italics. See also BLF Ms Ashburn. 128.10, fol. 14/r.

⁷³ KBK Ms K.S. 3467,8, fols 70-72.

'where it is said that Christ was baptised by St John', and 'a piece of the stone on which Christ sat when he lamented the city of Jerusalem'.⁷⁴

This category flowed naturally into what Paludanus himself called reliquae: a reliquary with the bones of fourteen Dutch martyrs, grains that had been blessed by the Pope, rosaries of gold, silver, ebony, and olive wood 'from the Mount of Olives'. 75 Besides these relics, Paludanus also had countless devotional items from all over the world: an Indian fabric with the name of Christ embroidered in gold on it, flagellants' birches from Spain, and a large number of crucifixes of various provenance, dimensions and materials. Given the fact that Paludanus was a Protestant, it is difficult to give a simple explanation for the present of the latter series of objects, which were generally associated with Popish superstitions. Perhaps they were souvenirs of Paludanus' journey to the Holy Land. This seems quite possible: the catalogue opens with the words: 'The following relics were brought from Rome and Jerusalem'. 76 However that may be, it is the case that both relics tainted by Catholicism and naturalia less specifically linked to a particular religious denomination but which illustrated the events recounted in the Bible occupied a prominent place in Paludanus' collection. The latter category was represented in particularly large numbers and will have been regarded by Protestants as pious rather than offensive. A comparison with Mosaic natural science in the spirit of Danaeus and Franzius comes immediately to mind.77

So visitors to Paludanus' collection could receive the pious message in a variety of ways: through the universal character that reflected God's creation, or through the numerous silent witnesses to biblical events. Individual objects, such as unicorn horns, could also bear a religious message. Paludanus had a number of such *naturalia*, such as birds of paradise and remoras, which were very popular with those who investigated the natural world and with emblematists. All of these creatures played an important role in late sixteenth-century natural history and were also prominent in such works as the *Symbola*

 $^{^{74}}$ BLF Ms Ashburn. 128.10, fol. 14; KBK Ms K.S. 3467,8, fols 70, 73, 79, 80, 105 and passim.

⁷⁵ KBK Ms K.S. 3467,8, fols 64–70.

⁷⁶ Ibid., fol. 64/v.

⁷⁷ Cf. Danaeus, *Physica christiana*; Franzius, *Historia animalium sacra*.

et emblemata by Camerarius.⁷⁸ Paludanus' own album amicorum included a large number of emblems as well as the inscriptions by his friends and visitors.⁷⁹

Birds of paradise were discovered in the East by Europeans in the sixteenth century. They were very popular among collectors, not only because of their exceptionally beautiful plumage, but above all because it was believed that they spent their whole lives in the air 'without coming to the ground, because they do not have feet'.80 Since local taxidermists removed the feet, if they had not already been damaged during the journey, the bird of paradise became a favourite in books of emblems, such as that of Camerarius.81 It was not until late in the seventeenth century before there was a general acceptance in Europe that birds of paradise did in fact have feet. Linschoten had brought two of them for Paludanus, naturally 'without feet'.82 Another remarkable creature was the remora. This fish, which attaches itself to larger fish and to ships by means of a suction pad, had been credited with the ability to brake or even divert ships ever since Pliny.83 In his account of India, Linschoten tells how one of them had pulled a ship which had put to sea a fortnight earlier straight back to harbour 'against wind and weather'; 'investigation with credible and truthful witnesses has shown this to have happened, which is why it is held to be a wonder'.84 Paludanus had a remora, which Aldrovandi had described as an exemplum of God's almightiness. 85 Besides these astonishing creatures, Paludanus also had other animals to which similar emblematic meanings were attached around 1600, such as a large number of crocodiles, whale and hippopotamus parts, and a barnacle goose (a creature that was believed

 $^{^{78}}$ Harms, 'On Natural History and Emblematics'; Idem, 'Beteutung als Teil der Sache'.

⁷⁹ KB Ms 133 M 63, passim.

⁸⁰ Linschoten, *Itinerario* I, 81. On birds of paradise in European collections see: Schnapper, *Le géant, la licorne, la tulipe,* 80–82; Mason, *Before Disenchantment,* 134–136.

⁸¹ Camerarius, Symbola et emblemata I, 42.

⁸² Linschoten, Itinerario I, 82.

⁸³ Copenhaver, 'Tale of Two Fishes'; Schnapper, Le géant, la licorne, la tulipe, 67–69.

⁸⁴ Linschoten, Itinerario I, 210.

⁸⁵ KBK Ms K.S. 3467,8 s, fol. 32/v; Aldrovandi, De Piscibus, 415-423.

to grow on trees in Scotland).⁸⁶ However remarkable and extraordinary, in the last resort they were all a part of the natural world.

A child of his time, Paludanus was also fascinated by bizarre and praeternatural phenomena. Surprisingly, his collection did not include any freaks, but there were a large number of unusual naturalia such as shells with an anti-clockwise spiral, 'which is contrary to nature', stones in the form of shells and plants (i.e. fossils, which were not understood as such in the seventeenth century), and a stone from Mount Sinai in which the figures of trees were visible.87 Paludanus remarked on a number of anthropomorphic polyps and corals that 'a lover of nature and of God almighty's wondrous works could benefit from speculating about them'.88 He no doubt took the same view of the other mirabilia. One of these was the 'shell or horn on which Chaldean letters are inscribed by nature'. Scaliger sketched this bearer of arcane signs.⁸⁹ It is probably not fortuitous that Paludanus called in the greatest philologist of his time to study this enigmatic letter from the Book of Nature. More detailed source material is lacking, but Scaliger's fascination will have been partly due to the hope of catching a glimpse of the paradisiacal knowledge of nature via this alleged Chaldean script.

God's unfathomable creative force was also demonstrated on the basis of the order in nature. Many *naturalia*, whether found close to home or in the remote corners of the world, referred to the creator of heaven and earth: dried plants, minerals, stones, etc. *Insecta* are not mentioned in the sources, with the significant exception of the emblematic locusts, butterflies and a stag beetle. Paludanus did have a large collection of shells, precious objects to which similar symbolic meaning was attached.⁹⁰ As a contemporary of Paludanus, the poet Philibert van Borsselen (ca. 1575–1627) explained in his longwinded poem *Strande oft ghedichte van de schelpen* (*Beach or poem of the shells*,

⁸⁶ On the barnacle goose see Egmond and Mason, 'Report on a Wild Goose Chase'; Mason, *Before Disenchantment*, 61–86.

⁸⁷ KBK Ms K.S. 3467,8, fol. 40/v and 70/r; BLF Ms Ashburn. 128.10, fol. 4/v.

⁸⁸ KBK Ms K.S. 3467,8, fol. 44/v; on anthropomorphic *naturalia* see see Findlen, 'Jokes of Nature'; Schnapper, *Le géant, le licorne, la* tulipe, 15–31; Daston and Park, *Wonders and the Order of Nature*, passim.

⁸⁹ OAH inv.no. 2059, fols 81-82.

⁹⁰ Cf. Dance, *History of Shell Collecting*, who writes that Paludanus 'did not have many shells', 11. See also: Leonhard, 'Shell Collecting'.



Fig. 44. Until the beginning of the seventeenth century, scholars believed that birds of paradise ('antipodiae') did not posses feet and, hence, had spend their entire life in flight. This created the basis for emblematic imagery, as in Joachim Camerarius' *Symbola et emblemata* (1592) (KB).

1611), shells had such a regular and beautiful structure that only the divine artist could have made them.⁹¹

It is natural to suppose that Paludanus' large collection of more than 4,000 shells and 4,700 other marine products provoked similar associations in the minds of many of his educated visitors. At any rate, we can find an echo in Paludanus himself. The catalogue contains the following description of one of the cabinets:

Various spiral or twisted shells, mussel shells and snail shells, mediumsized, small and very small, all different in form and colour: herein can be seen God, of whose wondrous almighty power the poet has rightly said: 'Divine power sports in human matters'.92

If we view Paludanus' continually expanding collection as a whole, we can conclude that there was a very strong emphasis on natural history. Paludanus belonged to the intellectual world of his friends Aldrovandi and Camerarius, for whom textual references and symbolic meanings played such an important role. The divine message could be understood in various ways: by emphasising the order and regularity of the creation, by stressing that it was the praeternatural that demonstrated God's power, by emblematism, and—very importantly—by means of the Bible, which offered the key to understand mummies, parts of biblical animals, stones from sacred mountains, and so on.

As evidence that Paludanus' collection could produce the effect of religious edification upon those who saw it, Hugo Grotius used a plethora of terms to make comparisons between Paludanus' collection and the Ark, a treasure chamber, or a temple of the world. Other visitors had recourse to similar vocabulary and described the collection as a humanist *studiolo*, a pleasure garden, or a *musaeum*—all places where a scholar could devote himself to pious reflections. Paludanus' *album amicorum* (which functioned more or less as a register of visitors) contains repeated entries of the words of the Psalmist: 'Oh Lord, how manifold are thy works!' Paludanus continued to welcome scholars and *amateurs* into old age (he died in 1633). They included the Danish scholar Ole Worm (1588–1654), who was to form one of

⁹¹ Van Borsselen, Strande oft ghedichte van de schelpen, 5.

⁹² KBK Ms K.S. 3467,8, fol. 49/r. The quotation is from Ovid, *Epistulae ex Ponto* IV, 3, 39.

⁹³ KBK Ms K.S. 3467,8, fols 1/r-10/v.

⁹⁴ See for example KB Ms 133 M 63, fol. 265/v; fol. 497/r; fol. 574/r; fol. 575/r and fol. 567/v.

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the most famous collections of curiosities of the seventeenth century and to whom Paludanus gave some *naturalia*. Many of these foreign visitors also included Leiden in their visit to the Netherlands, where, in spite of Paludanus' polite refusal, it had nevertheless proved possible to establish collections of curiosities of European renown.

Collections of curiosities in Leiden

Like Paludanus, the first generation of professors of medicine in Leiden had studied in Italy, where they were introduced to the new way in which *scientia* was taught by practical demonstration. The Leiden governing body wanted to see medicine taught in the same spirit in the young university. In 1593 a part of the Faliede Begijnenkerk was turned into an anatomical theatre, while on the other side of the Rapenburg canal an uncultivated plot of land was turned into a botanical garden in 1593–1594. Both the *theatrum* and the *hortus* were complemented with a collection of curiosities from around 1600. These rarities were intended not only as teaching aids in medicine but also to teach professors, students and interested lay people moral lessons. The library, the theatre, the garden and the collections of curiosities formed an indivisible whole.

Both collections of curiosities were the brainchild of Petrus Pauw. He had studied in Leiden and Padua before receiving a special appointment as professor of medicine in Leiden in 1589. He performed dissections and advocated the setting up of an anatomical theatre (to be housed in the same building as the library) right from the start of his appointment. He was also formally responsible for the botanical garden. The theatre, the garden and the collections were based on a single overarching concept, that of the *theatrum sapientiae*. In the course of the seventeenth century both collections expanded considerably under Pauw's successors and formed not only a three-dimensional teaching aid but also an important attraction for students and tourists.

After it had become clear that Paludanus wanted to stay in Enkhuizen, the governing body of the university in Leiden managed to engage the world-famous botanist Carolus Clusius for the projected botani-

⁹⁵ Worm, Musaeum Wormianum, 144, 189.

⁹⁶ Molhuysen, Bronnen I, 153*-154*.

⁹⁷ Ibid. I, 180*.

⁹⁸ Catalogus principum, civitatum, et singulariorum, 56.

cal garden in 1592. Paludanus and Clusius were friends, and both men also corresponded with Camerarius, Aldrovandi and many other scholars.⁹⁹ Upon Clusius' appointment in Leiden, it was stipulated that, like the at least equally famous Scaliger, who arrived at more or less the same time, he would not have any teaching obligations. Clusius' reputation reflected on the university, and thanks to his far-flung international network, many exotic plants, bulbs, seeds and rarities found their way to Leiden. The garden was actually laid out by Dirck Outgaertsz Cluyt (see previous chapter). By September 1594 Cluyt was able to send a description of the layout of the botanical garden to the governing body.¹⁰⁰

The botanical garden project was not confined to planting the beds. Cluyt had tried in vain to have a shed erected for non-hardy perennials. After Cluyt's death in 1598, the ambitious Pauw was appointed in his place. 101 The professor managed to secure a considerable sum from the governing body for the construction of a larger project, a gallery (ambulacrum). This was intended not only to protect the plants in winter but also to supplement the study material that was growing in the garden. The gallery on the south side was completed in 1600; work on the building of a gallery on the north side commenced in 1610. 102 This afforded a place where current literature (including Pliny's natural history) and world maps could be consulted and many curiosities could be viewed. Pauw's 1601 description of the garden refers explicitly to the examples of Camerarius, Imperato and Aldrovandi. 103

The rapidly growing collection of curiosities is central in this connection, although the context in which it was formed has to be taken into account as well. Clusius and Pauw probably contributed rarities from their own collections. In addition, the instigators and crews of the first Dutch expeditions to the East responded to their request to collect 'seeds, fruits, bulbs, roots, spices, flowers, gums, resin, animals, marine products and similar objects to be found in those lands that are unusual or unknown here' for the botanical garden. ¹⁰⁴ As they arrived in Leiden, the *naturalia* were compared with the works of the classics.

⁹⁹ Egmond, 'Clusius and Friends'; Eadem, 'Correspondence and Natural History'.

¹⁰⁰ Molhuysen, *Bronnen* I, 317*-334*.

¹⁰¹ Ibid. I, 112-113.

¹⁰² De Jong, Nature and Art, 129-140; Terwen-Dionisius, 'Vier eeuwen bouwen'.

¹⁰³ Pauw, Hortus publicus, *4/r, **2/v.

¹⁰⁴ Molhuysen, *Bronnen* I, 406*–407*; Heniger, 'Eerste Nederlandse wetenschappelijke reis'.

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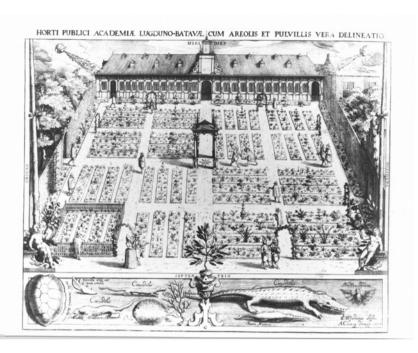


Fig. 45. The Leiden *hortus botanicus* was created in 1594, and extended with an *ambulacrum* in 1600. Here, all kinds of curiosities were at display such as the jaw of a polar bear, a swell-fish, the shell of a turtle, and many crocodiles (UBL).

It is significant that Clusius, who was as interested in etymology as any other sixteenth-century scholar, explicitly asked the seamen to note down the local names of the exotic items: 'one has to know these things in order to be able to describe them properly'. Knowledge of an object began with the study of its name, which might be supposed to contain traces of its nature. Pauw emphasised the importance of the names of plants and their etymology in his teaching conducted in the botanical garden. In the light of this, it is not surprising to find Scaliger, Clusius and Pauw all taking a lively interest in six books containing images of plants and their names in Chinese; like hieroglyphics, Chinese was a script that was suspected of being symbolic in nature.

¹⁰⁵ Hunger, L'Ecluse I, 267.

¹⁰⁶ Pauw, Hortus publicus, *4/r.

¹⁰⁷ Clusius, Exoticorum libri decem, 376.

Thanks to the energetic collecting activities, the collection of the botanical garden was continually expanded and soon achieved a prominent position in Europe. Sometimes mariners, scholars and travellers donated items spontaneously; Clusius and Paludanus exchanged curiosities with one another; Cluyt's son Augerius Clutius sent material to Leiden from South Europe and Africa; and in 1601 Pauw was able to send Aldrovandi seeds that were not even present in Bologna. Many of the *naturalia* in Leiden were described and illustrated in Clusius' monumental *Exoticorum libri decem* (1605), which almost in passing provides a wealth of information about the extensive network of collectors and the strange objects that could be seen in Leiden. 109

This work and other sources enable us to form a good impression of the content and presentation of the collection of curiosities. 110 While Paludanus had tidily arranged his treasures in cabinets more or less on the principle of grouping by sort, the style of presentation adopted in the galleries of the botanical garden was probably more associative amid the maps and books. It is likely that large objects, such as the three crocodiles, whalebones, and the shell of a giant tortoise were suspended from the ceiling, while the smaller ones were attached to the wall or placed in cabinets, somewhat as they are in the well-known illustrations of the cabinets of Ferrante Imperato (1599) and Ole Worm (1655). By the beginning of the seventeenth century we know that the Leiden botanical garden also contained two penguins, 'the beak of a strange bird', bats, various corals, an armadillo, a remora, a moonfish, and the foot of a cassowary. All kinds of exotic objects were interspersed among these naturalia, such as 'various kinds of Chinese paper', 'two Indian almanacs' and 'a necklace of teeth from the Indies'. The rare bird of paradise was there too; Clusius describes how difficult it was to obtain an exemplar and how he and Scaliger examined it. The illustration of the bird in the Exoticorum lacks feet, but Clusius was rather sceptical about this aspect.111

¹⁰⁸ KBK Ms 3467,8, fols 54–68; Clusius, *Exoticorum libri decem*, passim; Berendts, 'Clusius and Paludanus'; Molhuysen, *Bronnen* I, 436*–437*; BUB, Fondo Aldrovandi 136 T XXXI, fols 222–223 'Catalogus seminum quae e me [Aldrovandi] petit Petrus Pavius horto Leidensi praefectus'.

¹⁰⁹ Egmond, 'Clusius and Friends', Mason, Before Disenchantment, 134-135.

¹¹⁰ UBL Archief Curatoren nr. 228, 'Inventaris van de Rariteyten'; Verscheyden rarietyten, Inde Galderijen des Universiteyts Kruyt-Hoff; De Jong, Nature and Art, 150–157.

¹¹¹ Clusius, Exoticorum libri decem, 358–363; Mason, Before Disenchantment, 124–148.

After the death of Clusius in 1609 and that of Pauw in 1617, the additions to the collection included all kinds of *naturalia* with a symbolic meaning, such as further birds of paradise, a barnacle goose, a 'dragon', the skin of a sloth, and a 'West Indian animal'. These objects clearly betray the influence of the contacts with the West. Although it was considerably smaller, the collection of curiosities in the Leiden botanical garden thus had the same character as the collection belonging to the man who had been invited to become its first superintendent, Paludanus. There is, however, one important difference: objects referring to biblical events, which were so prominent in Enkhuizen, were not to be found in the botanical garden.

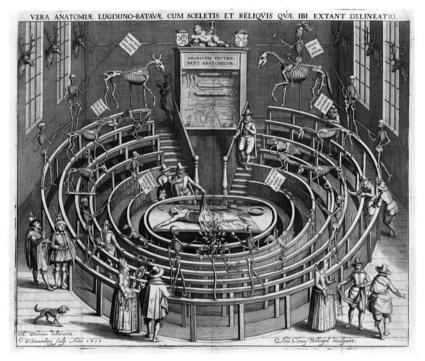


Fig. 46. The Leiden *theatrum anatomicum* formed the counterpart of the *hortus botanicus*. During the summer, skeletons were at display, carrying banners with humanist motto's such as 'nosce te ipsum' or 'homo bulla' (UBL).

¹¹² Verscheyden rariteyten, Inde Galderijen des Universiteyts Kruyt-Hoff.

Nevertheless, this category was represented in Leiden, but elsewhere: inside the anatomical theatre on the other side of the Rapenburg canal. Although physically separated by the water, the anatomical theatre and the curiosities collected in it were part of the same concept as the botanical garden and its galleries. Curiosities regularly crossed from one side of the canal to the other as a result of both epistemological insights and practical considerations. The formation of the anatomical collection was the initiative of the indefatigable Pauw. He started to perform dissections in the recently completed anatomical theatre in November 1593. 113 In the summer, when no dissections were carried out, the professor displayed the skeletons of humans and animals on the benches of the anatomical theatre. The familiar 1610 engraving by Willem Swanenburg clearly shows that they bore pennants with such humanist mottos on the transient nature of life on earth as 'Know yourself' (Nosce te ipsum), 'Man is a bubble' (Homo bulla), and Memento mori. Pauw placed two skeletons on the main dissection table to represent Adam and Eve, with the Tree of Knowledge from which Eve had just plucked an apple between them. This was not only a warning against excessive curiosity, but also an allusion to the time when man named every living creature. The intrinsic connection between the culture of collecting and philology is nowhere shown more clearly than by the presence of 'the bladder of the widely famed Isaac Casaubon', the philologist who had died in 1614.114

After Pauw's death in 1617, his fairly modest collection was continued very energetically by his successor Otto Heurnius (1577–1652). Heurnius was appointed in 1601 to succeed his father Johannes (who had published on comets) and was to occupy one of the chairs of medicine for fifty years. He has gone down in history as the man who introduced clinical teaching in Leiden in 1636, an important innovation that has to be seen in the light of the growing emphasis on empiricism. ¹¹⁵ This is also the background to Heurnius' unflagging dedication to the anatomical theatre. ¹¹⁶ All the same, it would be inaccurate to characterise him as a champion of modern scientific insights. For a proper understanding of his position it is necessary to refer to his 1600 publication,

¹¹³ Huisman, Finger of God, 26-42.

¹¹⁴ UBL Archief curatoren no. 228, 'Inventaris van de Rariteyten opte Anatomie'.

¹¹⁵ Beukers, 'Clinical Teaching'.

Lunsingh Scheurleer, 'Amphithéâtre moralisé'; Huisman, Finger of God, 46-75.

Barbaricae philosophiae antiquitatum libri. Like so many scholars of his time, such as Scaliger and Willebrord Snellius in Leiden, Heurnius believed in the existence of a prisca scientia. Although the wisdom of the Chaldeans, Babylonians and Egyptians had largely perished, it was possible to obtain a glimpse of it by studying the philosophical writings of the barbarians. Heurnius' ideas about the musaeum were largely inspired by this conviction, as was already shown by the first purchase that Heurnius made from the Leiden bookseller Basson 'for the necessary instruction, adornment and function of the place of anatomy'. Heurnius paid a large sum for engravings including the Tower of Babel and the Golden, Silver, Bronze and Iron Ages. The latter symbolised the Fall and the subsequent human misery and loss of scientia.

We can obtain an accurate picture of the collection in the anatomical theatre from the inventory compiled by Heurnius in 1620.¹¹⁹ A second inventory was drawn up soon after Heurnius' death.¹²⁰ They show that, besides the skeletons that Pauw had collected, world maps and representations of contemporary *mirabilia* such as a beached whale and a herring with strange markings were also on show. Although only incidentally displayed in Paludanus' collection and in the botanical garden, the fascination with the monstrous and preternatural that was so striking in contemporary Europe also had Heurnius in its grip. His presentation included a monstrous kidney stone, representations of the excrescences on the head of a baby from Leiden, a *fungus lapideus*, and grotesquely malformed bones. As a token of respect to his father, Heurnius kept 'six stones found in the bladder of the late D. Joannes Heurnius'. So the anatomical theatre gradually came more and more to resemble a veritable collection of curiosities.

The most remarkable items in Heurnius' collection were the numerous allusions to biblical and classical history. Besides citations from the Holy Scripture, there was a wealth of artefacts that recounted the history of biblical Egypt: a woodcut of the Crossing of the Red Sea, a canopic urn, 'an Egyptian scarab carved from cornelian', three stones with hieroglyphs, images of Isis 'that are full of hieroglyphs', an adder,

¹¹⁷ Heurnius, *Barbaricae philosophiae libri*; see above Chapter Two; Jorink, 'Noah's Ark Restored (and Wrecked)'.

¹¹⁸ Molhuysen, Bronnen II, 79*-80*.

¹¹⁹ Barge, Oudste inventaris.

¹²⁰ UBL Archief curatoren no. 228, 'Inventaris... Jare MDCLII'.

'idols that were found with the mummies in the cellars beneath the ground in the land of Egypt', and other funerary items. There was naturally a stuffed crocodile, but the most spectacular items were two mummies and a sarcophagus. Like Paludanus, Heurnius had managed to obtain these extremely rare relics from biblical Egypt. He states explicitly that all of these Egyptian items were donated by David le Leu de Wilhelm (1588-1658), who later became the brother-in-law of Constantijn Huygens. Le Leu had studied oriental languages in Leiden before setting up as a merchant in Aleppo, from where he had undertaken journeys to Egypt. The correspondence between Heurnius and Le Leu shows the enormous fascination of the Leiden professor for ancient Egypt. After having sent the mummies, the merchant was beset with requests for more artefacts that threw light on the customs of antiquity, such as another couple of mummies, the head and penis of a hippopotamus, an ibis, funerary figurines, papyri, 'a tower-shaped headdress of a native woman from antiquity', and—an interesting detail—'four pounds of red lentils'. 121 Heurnius gave Le Leu full information about the motives behind his thirst for objects: Egypt was 'the ancient tutor in every branch of science'.

Le Leu's dispatches of a variety of objects from Egypt met with profuse expressions of gratitude from the Leiden professor. They were the *pièce de résistance* of the anatomical theatre and were transferred in 1821 to the National Museum of Antiquities that was established in Leiden. Heurnius' fascination with the particularly remarkable mummies can be seen from the fact that he wrote a three-volume work on them, *De mummia sive conditura cadaverum antiquorum et neotericorum*, though it never went into print. However, a broadsheet edition of a brief *Explicatie der mummie* (Explanation of the mummy) was printed and hung above the large mummy. This mummy was Heurnius' prize item, beautifully displayed in the open sarcophagus. The public was asked to treat it with great care as it was very fragile because of its 'immense antiquity. In his explanatory text, Heurnius described in detail how Le Leu had removed the mummy from

¹²¹ Stricker, 'Correspondentie: Van Heurn—Le Leu de Wilhem'.

¹²² Wijngaarden, Van Heurnius tot Boeser.

¹²³ Barge, Inventaris, 51; Molhuysen, Bronnen II, 191; III, 38, 65-67.

Breugelmans, 'Een document'; Barge, Inventaris, 51.

¹²⁵ Barge, Inventaris, 50.

¹²⁶ Les delices de Leide, 89.

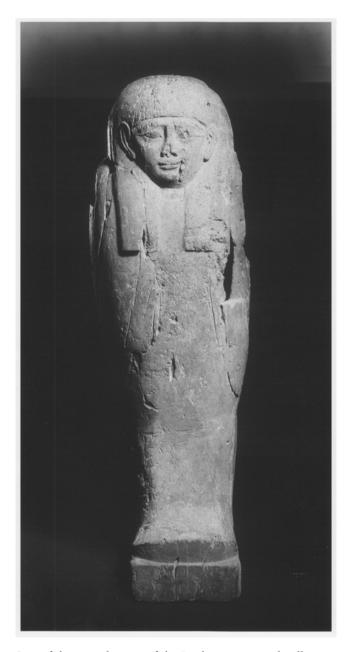


Fig. 47. One of the prized items of the Leiden anatomical collection was this Egyptian sarcophagus. The curator of the collection, professor Otto Heurnius, published two descriptions of the 'great mummy' (Rijksmuseum voor Oudheden Leiden).

a tomb of the 'ancient heathen Egyptians near the pyramids...beside the River Nile, from which Moses was rescued by the daughter of the king pharaoh'. 127

It will be clear that Heurnius was not primarily interested in the alleged medicinal effect of mummy. ¹²⁸ In principle the same applied to him as to Paludanus: the mummies told the story of God's chosen people in the heathen land of wisdom, Egypt. One of Heurnius' aims, as he wrote unambiguously to Le Leu, was to obtain more insight into this kingdom that had been described by Moses, Herodotus and Pliny. ¹²⁹ At the sight of the mummy, scripturally minded viewers, as everyone was at the time, will have immediately been reminded of such passages as the last verse of *Genesis* which describes the embalming of Joseph.

It is indicative in this context that, like so many of his contemporaries, Heurnius was fascinated by hieroglyphs. Since the rediscovery and publication of Horapollo's Greek treatise (1505), Neo-Platonic circles in particular engaged in intense speculation about the nature of these signs, which were thought to provide insight into the essence of things. 'It had nothing in common with ordinary graphic systems operating with words and letters', wrote Iversen, 'and, although they appeared as ordinary pictures of material objects, the individual signs were in reality symbolic entities, revealing their true meaning only to initiated readers by means of a divinely inspired process of intellectual enlightenment'. ¹³⁰ In the sixteenth century the *Hieroglyphica* and the *Corpus Hermeticum* gave rise to an enormous fascination with the *prisca theologia*. The hieroglyphs, which had not yet been deciphered, offered glimpse of the lost knowledge of nature from before the Fall and Babel.

For a proper understanding of Heurnius' intellectual position we have to refer to his book on barbarian philosophy, which was reprinted without any changes in 1619 under the more meaningful title *Babylonica*, *Indica*, *Aegyptia...philosophiae primordia*. Heurnius had no doubts about the primordial philosophy: it was situated in Egypt (which he, remarkably enough, identified with Babylon). Before God gave mankind (Hebrew) writing via the Ten Commandments,

¹²⁷ Breugelmans, 'Een document', 234.

¹²⁸ Cf. Smits, Het oude Egypte, 36.

¹²⁹ Stricker, 'Correspondentie Van Heurn—Le Leu de Wilhem', 50.

¹³⁰ Iversen, Myth of Egypt, 64.

things were identical with their name.¹³¹ Heurnius considered that hieroglyphs predated Moses' ascent of Mount Sinai, and he regarded them not as a language but as a system of symbols that embodied the real nature of things. 132 The figurines inscribed with hieroglyphs from Egypt in Heurnius' collection were thus nothing less than the by now indecipherable remains of the period when Adam gave their names to the cattle, the birds of the air and the beasts of the field. 133 Hieroglyphs were not the only remnants from this period; there were also the writings of Hermes Trismegistus, the Corpus Hermeticum. While Neo-Platonists since Ficino usually regarded Hermes Trismegistus as a contemporary of Moses, Heurnius placed him much earlier. In one of the few academic treatises on the hermetic texts to be written in Holland, Heurnius endowed that corpus with an even greater authority than the Neo-Platonists had done. Paradoxically enough, he did so in the very years in which the French scholar Casaubon exposed the texts as a forgery from the first century AD.134

The contents of Casaubon's treatise, however, do seem to have escaped the attention of the Leiden professor. According to Heurnius, the divine knowledge of Hermes had already been revealed to Noah and his son Ham, and Hermes had been the teacher and scribe of Ham's son Cush. Hermes' knowledge had therefore been disseminated in Egypt, which had been the school of Moses and Plato. Heurnius thus plainly declared here what he would later write to Le Leu: that Egypt was the cradle of all the sciences. The considerable quantity of Egyptian items that had been collected in Leiden could thus be regarded as tangible manifestations of the *prisca theologia*. 137

The Leiden collections in the botanical garden and the anatomical theatre show clearly how inextricable the link was between words and things, between philology and the study of nature. Back to Paradise was the goal, back to the time, as Calvin put it, of the 'speechless teaching of heaven and earth'. This is an excellent example of how the

¹³¹ Heurnius, Babylonica, Indica, Aegyptia...philosophiae primordia, 31.

¹³² Ibid., 204.

¹³³ Barge, Inventaris, 55.

¹³⁴ Grafton, Defenders of the Text, 145-161.

¹³⁵ Heurnius, Babylonica, Indica, Aegyptia...philosophiae primordia, 242. Cf. Genesis 10:6.

¹³⁶ Heurnius, Babylonica, Indica, Aegyptia...philosophiae primordia, 60, 80.

¹³⁷ Ibid., 249.

¹³⁸ CR 51, 10. See also Calvin, Institutes I, XIV, 1-2; I, X, 1.

collecting of curiosities has to be understood in terms of the Book of Nature. Bono characterised this pan-European tendency as follows:

If God's Word found expression in his authorship of the Book of Nature, and if that same creative Word—known to Adam immediately through his grasping of the divine meaning implanted in his own language—survived in corrupted or veiled form in language(s) accessible to postlapsarian man, then humans could potentially read the secrets contained in the Book of Nature through exegesis of discourse about nature, particularly written in ancient tongues.¹³⁹

This is the background against which the laying out of the botanical garden, the building of the anatomical theatre, and the collection of *naturalia* should be seen. From the perspective of the quest for the *verbum Dei*, it is understandable that Clusius gave mariners instructions to note down the names of native *naturalia*, that Pauw emphasised the importance of etymology, that Scaliger studied books of plants with Chinese characters and shells with Chaldean inscriptions, and that Heurnius was so fascinated by mummies and hieroglyphs. Philology, natural history and collections of curiosities virtually formed a holy trinity.

Humanist collectors: Brinck, Colvius and De Laet

The Leiden professors passed their passion for collecting on to their students. We see the same fascination with Bible study, ancient languages and *naturalia* in the collections of a number of scholars who attended the University of Leiden around 1600: the dignitary of Harderwijk Ernst Brinck, the Dordrecht preacher Andreas Colvius, and Johannes de Laet, the Leiden cosmographer and governor of the Dutch West Indian Company. Language, object and piety formed an indissoluble whole in their collections. The cabinets of these scholars have not been studied before, but they are particularly interesting in the present context, partly against the background of developments in textual criticism.

Ernst Brinck (ca. 1583–1649) attended Leiden University in 1605 and 1606, where he naturally visited the botanical garden and the anatomical theatre. ¹⁴⁰ Brinck's *album amicorum* from this period includes

¹³⁹ Bono, Word of God, 76.

¹⁴⁰ Van Rappard, *Ernst Brinck*; Van Wijhe, 'Leiden in het begin van der 17^e eeuw'; Gogelein, *Hortus Horti Horto*, 15.

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inscriptions by Scaliger, Clusius and Pauw.¹⁴¹ Brinck had already been travelling by then: he studied in Paris around 1603, where he probably was tutored by the great Casaubon. Brinck had a broad interest in *naturalia* and antiquities and was a gifted student of oriental languages. On the basis of his knowledge of Arabic and Turkish, he was appointed as secretary to the delegation of the United Netherlands in Constantinople in 1612. He set out on the homeward-bound journey to the Dutch Republic around 1614, passing through Italy on the way, where he took advantage of the opportunity to visit the famous collection of curiosities of Ferrante Imperato in Naples and the university in Padua.

After returning from his travels, Brinck held all kind of administrative positions in his native city of Harderwijk until his death in 1649. He was mayor several times, and was on the governing body of the Academy of Gelderland, the rather ailing university which was situated in the provincial town of Harderwijk. Besides his administrative work he found enough time to devote himself to the study of nature, other cultures and foreign languages. His only known publication is a translation of Mercator's *Atlas minor* (1630). Inspired by Pliny, Brinck made notes on everything that excited his curiosity. He also collected rarities and annotations on the most diverse languages. One of Brinck's albums contains texts in no less than two hundred languages.

Brinck's collection of curiosities was a logical product of his philological interests. The collections of *verba* and *res naturae* blended naturally with one another. No printed or manuscript catalogue is known, but his annotations nevertheless serve to provide an indication of the character of his cabinet, *constkamer* or *musaeum*, as he called it. Brinck wrote a three-part manuscript *Historia animalium* in which he described 'some noteworthy properties and wondrous natures' of countless creatures. He noted in many of the entries that he had (part of) this animal in his collection. We know from other sources that the collection also included man-made objects, books, prints and antiquities. They were all kept in Brinck's library—once again we find the classical concept of the *musaeum*.

¹⁴¹ KB Ms 135 M 86.

¹⁴² KB Ms 135 K 4.

¹⁴³ OAH inv.no. 2058, fol. 3/r.

¹⁴⁴ Van Slichtenhorst, Geldersche geschiedenissen, 102; Van Rappard, Ernst Brinck, 86; OAH inv.nr. 2062, fol. 28.

Incidentally, Brinck was no slavish copier of the ancient writers. He mentioned all the relevant literature (Aristotle, Pliny, Gessner and Aldrovandi) in his books of annotations on animals, but his remarks display a critical sense, a strong emphasis on his own experiences, and a predilection for what is striking and strange. The section on the sparrow, for instance, is not a summary of Aldrovandi or a description of the Dutch house sparrow, but records his own observation of white sparrows with red eyes. 145 The descriptions of many creatures begin with the comment that he had seen an exemplar in somebody else's cabinet, or that he had one himself. The main points of reference are the collections of Ferrante Imperato, Bernardus Paludanus, and the Leiden Academy. He is clearly aware of the problematic status of his own observations vis-à-vis the textual tradition. For instance, he comments on the biblical cockatrice (see Isaiah 59:5, for example) that Paludanus had one in his collection, and that he had seen an exemplar of the phoenix in the Constkamer in Dresden. 146 In these cases the empirical evidence seemed to confirm the textual tradition, but the reverse could happen too. For example, Brinck writes that Paludanus thought the bird of paradise did not have feet. However, he himself owned two of them and could thus state 'all of them have feet'.147

What else did Brinck have in his *musaeum*? The annotations give the impression of a typical collection of curiosities of a scholar in the early seventeenth century. The collection in Harderwijk contained the feet, claws and bones of exotic animals, beaks of foreign birds, Indian feather ornaments, three armadillos, the teeth of a hippopotamus, shells (including some with 'natural representations'), and the horn of a unicorn. He Neither did it lack various praeternatural objects. Like Paludanus and Heurnius, Brinck also had a collection of Egyptian objects. An Egyptian figurine from his collection was sketched by an assistant of the famous scholar Athanasius Kircher for his *Oedipus Aegyptiacus*. Kircher's envoy, Bartholdus Nihusius (1589–1657), mentioned that Brinck had received this figurine from Paludanus. Nihusius also noted the presence of Chinese books and Malay texts on tree-bark.

¹⁴⁵ OAH inv.nr. 2057, fols 107-110.

¹⁴⁶ OAH inv.nr. 2058, fol. 136/r; OAH inv.nr 2057 fol. 16/v.

¹⁴⁷ OAH inv.nr. 2057, fol. 15/r-v.

¹⁴⁸ OAH inv.nr. 2058–2060 passim; Deusing, De unicornu et lapide bezoar, 30.

¹⁴⁹ Kircher, Oedipus Aegyptiacus III, 431-432.

¹⁵⁰ PUG Ms 557 (Ep. Kirch. III), fols 222-223.

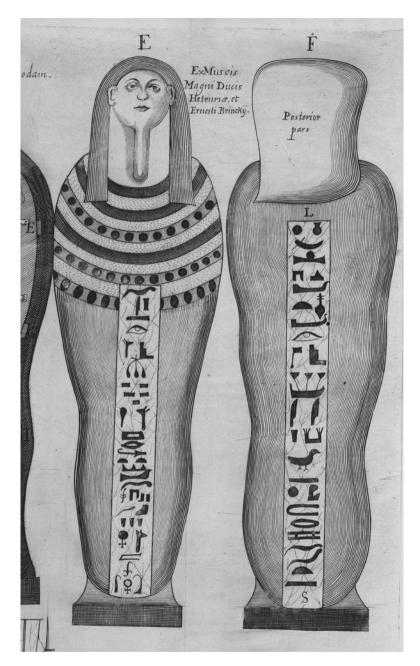


Fig. 48. Ernst Brinck was fascinated by Egyptian antiquities. A drawing of one of his statuettes (or shabti's) was included in Athanasius Kircher's *Oedipus Aegyptiacus* (1652) (KB).

Viewing it as a whole, we can conclude that Brinck's collection was fairly small by comparison with that of his friend Paludanus, but was not essentially different in character. With the exception of relics, it shows the same emphases and the same attempt to contain the whole of the created world.

A second scholar-collector was Andreas Colvius, whom we already came across in the previous chapter. He too had studied in Leiden. The Dordrecht preacher was much more involved with the scholarly world than Brinck. His close ties with such figures as Beeckman, Descartes, Huygens senior and junior, and Vossius senior and junior have already been mentioned. It is also interesting that Colvius was in contact with the famous savante Anna Maria van Schurman (1607–1678), to whom he sent a sheet written in Persian, Japanese and Siamese in 1637. Colvius is a good example of how a religious orientation led to a great interest in contemporary developments in natural philosophy. Time and again, the preacher claimed that God could be best known in his works (DEUS consideratur in creaturis). 151 He discussed the working of magnets with Gerardus Vossius, and his conversations with Isaac Vossius ranged over such matters as the nature of meteors, the refraction of light in Icelandic crystal, and the name of the tree on the Canary Islands mentioned by Pliny from which water was supposed to drip every day. 152 Colvius was in contact with other collectors, and his annotations contain regular notices about the curiosities that he saw in various places: the bone of a giant, a mummy, and a woman with three breasts. 153 He was interested in other wonders too, such as a man with what we could call a photographic memory. 154

Colvius himself formed a collection of curiosities. Its description was published in 1655 as *Catalogus musaei Andrea Colvii*. This source appears to have perished, but earlier authors who had the opportunity to see the catalogue mention a rich collection of shells, minerals, insects, animals, portraits, medals, books and manuscripts. Nevertheless, we can form a more detailed impression of the contents of

¹⁵¹ BLO Ms Rawls. lett. 84 (b), fol. 185.

¹⁵² *Vossii epistolae*, 252; BLO Ms d'Orville 270, fol. 3; BLO Ms d'Orville 270, fol. 79. On the tree of water see: Mason, *Before Disenchantment*, 40–44.

¹⁵³ Van Gelder, 'Liefhebbers', 310 note 51; BLO Ms d'Orville 470, fol. 79; UBL BPL 284, 'Adversaria', fols 101, 106, 108.

¹⁵⁴ Beeckman, Journal III, 199.

¹⁵⁵ Hoogstraten, *Groot woordenboek* II, 289; Van der Aa, *Biografisch woordenboek* III, 196.

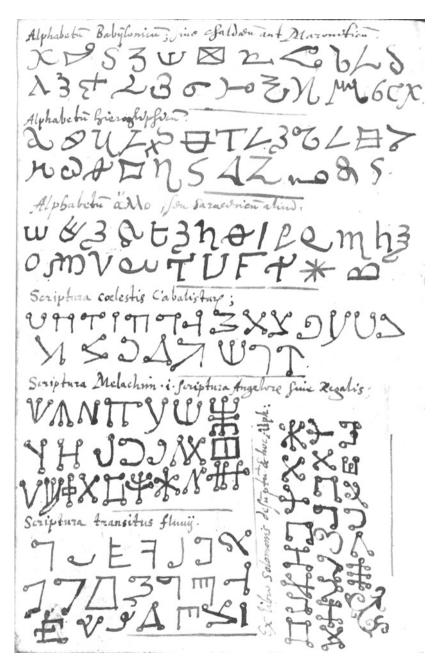


Fig. 49. Like so many humanists, Ernst Brinck was intrigued by ancient and remote languages. In his *album amicorum* he collected fragments of, among others, Chaldean, Babylonic and Cabbalist texts (KB).

Colvius' cabinet from other sources such as his correspondence. For instance, Constantijn Huygens sent him a piece of amber and a jar of balsam, the Italian physician Fortunius Licetus gave him a piece of phosphorus, the Amsterdam rabbi Mennasseh ben Israel presented a cacao bean, and Dutch West Indian Company governor Samuel Blommaert donated the hand of a mermaid. 156 The Danish scholar Ole Borch, who visited Colvius in 1662, mentions the wool of an animal called 'Borametz' or Lamb of Tartary (a sheep that was believed to grow on a plant), the eggs of serpents, crocodiles and parrots, pearl oysters, and acupuncture needles. 157 Colvius' colleague De Mey records the presence of a meteorite that had landed next door to Colvius. 158 We know from a letter from Colvius to his cousin Johan de Witt that he had a number of rare manuscripts, including copies of Galileo Galilei and unpublished material by Descartes. 159 Colvius followed common humanist practice in installing his collection in his library amid the works of Pliny, Gessner, Aldrovandi, Swammerdam, Descartes, Bacon and others, as well as of Imperato and Worm, the most widely used reference works in the field of collecting in the middle of the seventeenth century.160

Naturalia, artificialia and literature blended seamlessly. It is important to note that Colvius was very interested in other cultures, and constantly raised the question of whether they too could know God through contemplation of the Book of Nature. On the one hand, Colvius had his reservations about collecting ancient figurines (antiqua statua). Paludanus, Brinck and particularly Heurnius had thrown themselves enthusiastically upon these relics of pagan culture, but Colvius felt that this erudite activity was a mere step removed from idolatry. On the other hand, he eagerly awaited the publication of Gerardus Vossius' De theologia gentili, and kept sending his mentor relevant material for the preparation of that work, including travel reports from heathen Siam. Colvius meditated profoundly on the

 $^{^{156}}$ BCH V, 14–15; BCH V, 183; UBL Ms BUR F 6 B; BLO Ms d'Orville 468, fols 172 $^{-173}$

 $^{^{157}\,}$ OBI II, 171. On the Lamb of Tartary: Thorndike, History VII, 585; Mason, Before Disenchantment, 63.

¹⁵⁸ De Mey, Alle de Nederduitsche werken, 777.

¹⁵⁹ Thijssen-Schoute, 'Colvius', 88.

¹⁶⁰ Catalogus rarissimorum ac imprimis insignium librorum...Andreae Colvii.

¹⁶¹ UBL BPL 284, 'Adversaria', fol. 29.

¹⁶² BLO Ms Rawls. lett. 84 (b), fol. 182.

passage in the first Epistle to the Romans which describes how the people who do not know God's word can still recognise him in nature. But a question that he kept raising (and failed to resolve) was to what extent the contemplation of nature without knowledge of the Bible might be expected to lead to piety rather than animism or pantheism. ¹⁶³ In other words, what was the status of the Book of Nature without the word of God? Could the creation be understood in a proper Christian way without the Bible as the key to its interpretation? No, Colvius wrote to Gerardus Vossius. ¹⁶⁴ All the same, both the old humanist and the Dordrecht preacher had a lot of sympathy with natural theology.

In a letter to Descartes, Colvius wrote that man could learn God's almightiness from the Book of Nature (*ex libro naturae*). ¹⁶⁵ In the light of this background, it is not surprising that Colvius also regarded his collection as a mirror of God's almightiness. The same motif recurs in Colvius' correspondence. In a letter to Nicolaas Heinsius, he wrote how he had closely studied his collection of *naturalia* and had learnt from it the might and wisdom of God (*ex ijs potentiam et sapientiam Dei agnoscam*). ¹⁶⁶ He put it differently in a letter to Johan de Witt of 1660. Colvius was by then sixty-six years old, and wrote that with the approach of death he wanted to dispense with his cabinet, since he would shortly be able to contemplate the Heavenly Cabinet: 'I hope to soon see the cabinet of God, where I will be able to see the archetype, for I do not set such store by these feeble copies'. ¹⁶⁷ However, Colvius had to make do with the feeble reflection of God's almightiness in his study for another eleven years, as he did not die until 1671.

A third prominent scholar about whose cabinet virtually nothing was known so far is Johannes de Laet (1581–1649). This fascinating figure has recently begun to receive the attention he merits. De Laet studied classical languages, philosophy and theology in Leiden from 1597 to 1602. He made a good impression on Scaliger and Clusius; the latter described curiosities that he had received from his very erudite

¹⁶³ UBL BPL 284, 'Adversaria', fols 29-34.

¹⁶⁴ BLO Ms Rawls. lett. 84 (b), fol. 185.

¹⁶⁵ AT III, 680-682.

¹⁶⁶ UBL Ms BUR F 6 B.

¹⁶⁷ Colvius to De Witt, 14 October 1660, NA, Archief Staten van Holland, Archief Johan de Witt; *OCCH* II, 474–476.

¹⁶⁸ Bekkers ed., Correspondence of John Morris with Johannes de Laet; Cook, Matters of Exchange, 215–218.

and modest student in the Exoticorum libri decem (1605).169 After completing his studies. De Laet travelled to France and England. Upon his return to the Netherlands he revealed himself to be a fervent advocate of the Counter-Remonstrant cause. He took part in the Synod of Dordrecht and was partly responsible for the publication of its proceedings. 170 Afterwards he invested heavily in the Dutch West Indian Company and was appointed a governor of this enterprise in 1621. Although he never crossed the Atlantic, he built up an astonishing knowledge of foreign countries and their inhabitants. There were even complaints in America that De Laet took more interest in curiosities and writings about the New World than in the policy aspects of the company work.¹⁷¹ De Laet wrote the pioneering work *Nieuwe Wereldt* ofte beschrijvinghe van West-Indien (New World or description of the West Indies; first published in 1625, followed by many reprints and translations). In 1644 he started to publish the Jaerlijcks Verhael der West-Indische Compagnie (Annual report of the West Indian Company). In the course of time De Laet wrote descriptions of Spain, France, the Turkish empire, Mongolia, India, Persia and other countries for the famous Respublica series published by Elsevier. He also published an edition of Pliny's Naturalis historia (1635), a book on stones and minerals (1647), and an extremely polemical work against Hugo Grotius on the origin of the Amerindians (1643-1644). Scaliger whetted De Laet's appetite for the problems of philology, etymology and chronology. The young scholar was already corresponding with the great philologist in 1606 on the location of the Garden of Eden, and Scaliger's later Elenchus Davidis Paraei was dedicated to De Laet. 172 De Laet was also constantly searching for the roots of language. He had an endless fascination with Old Frisian, runes, hieroglyphs, Chinese characters and the languages of the New World, and he worked throughout his life on a dictionary of Old English which was never published. Linguistic arguments also played a major role in his debate with Grotius.

The more underlying background and implications of this controversy will be dealt with later. It is important that De Laet, unlike

¹⁶⁹ Bremmer, 'Correspondence of Johannes de Laet'; Scaliger, *Epistolae omnes*, 731–748; Clusius, *Exoticorum libri decem*, 76–77.

¹⁷⁰ Florijn, 'Johannes de Laet and the Synod of Dort'.

¹⁷¹ Jacobs, 'De Laet', 120.

¹⁷² Scaliger, Epistolae omnes, 735-736.

Grotius, did not blindly follow the *sapientia veterum* and the traditional biblical chronology. Significantly, his well-stocked library (like that of Colvius) included half a dozen works by Bacon and almost all of the publications of Descartes.¹⁷³ In his capacity as a governor the West Indian Company, and thanks to his excellent connections with Prince Johan Maurits, the Dutch governor in Brazil and his scientific staff, De Laet had direct access to an enormous flow of artefacts: Maya inscriptions, armadillos, colibris, anteaters, llamas, sloths, and so on.¹⁷⁴ The importance of these artefacts cannot be overestimated. Gradually De Laet must have become aware that they were not mentioned in the biblical or classical sources, and that the existing framework for the interpretation of the Book of Nature was thus inadequate. In spite of, or thanks to his profound knowledge of ancient texts, De Laet already reached the conclusion in 1625 that the New World 'was unknown to the ancient, as their texts indicate'.¹⁷⁵

De Laet generously shared the information and artefacts with his fellow scholars and collectors. His collection was the basis for his publications and speculations. Objects, drawings, descriptions and inscriptions were constantly related to the classical and contemporary literature. As De Laet wrote to Ole Worm, this collection was kept without a semblance of order and was not shown to strangers. ¹⁷⁶ De Laet's contact with Worm is a good indication of the importance of the collection. Worm was professor of medicine in Copenhagen, but he was particularly interested in the related discussions in natural history, history and philology (he was the first to decipher the enigmatic runes). 177 His Musaeum Wormianum (1655), which Constantijn Huygens celebrated in a poetic eulogy, was the basis on which many collectors modelled their collections. Worm's biographer calls De Laet the most important contact abroad of the famous Dane. 178 Thanks to De Laet, Worm came into the possession of a large number of artefacts from the New World, including Mayan inscriptions, the hand of a mermaid, and numerous plants, animals and minerals. At Worm's

¹⁷³ Catalogus bibliothecae...Joannis de Laet.

¹⁷⁴ Whitehead, 'Georg Markgraf and Brazilian Zoology'; Parker, Visions of Savage Paradise, 31–32 and passim; Cook, Matters of Exchange, 210–225; Mason, Before Disenchantment, 197–220.

¹⁷⁵ De Laet, Nieuvve Wereldt, **/r.

¹⁷⁶ Olai Wormi epistolae II, 815.

¹⁷⁷ Schepelern, Musaeum Wormianum; Hovesen, Lægen Ole Worm.

¹⁷⁸ Schepelern, Musaeum Wormianum, 170.

request, De Laet compiled a catalogue of his own collection. He sent the manuscript to Copenhagen in 1648, and all trace has been lost of it ever since, but from De Laet's correspondence and other sources we can deduce that in principle his collection had the same character as Worm's.¹⁷⁹

De Laet's work also shows how problematic it was to incorporate new empirical information into the existing frameworks. Empiricism did not automatically lead to what we would regard as correct insights. A good example is the debate on the unicorn. Both Paludanus and Brinck still believed that the horn that could be seen in churches and collections came from the biblical animal. The 1621 edition of Mercator's Atlas minor pointed out that this artefact was washed up in large numbers on the northern coasts, and that it was probably the tusk of a narwhal.¹⁸⁰ Worm had elaborated this idea further in a disputation of 1638.181 Worm's pupil Thomas Bartholinus (1616–1680) devoted his De unicornu observationes novae (1645)—a work that is regarded as the most exhaustive study of the unicorn ever written—to this theory. 182 The horn was that of a marine animal, not a hoofed animal. Nevertheless, the existence of a unicorn was not ruled out. After all, sea unicorns existed, and Bartholinus also described a large number of birds and insects with a horn. His work was read with more than polite interest by De Laet and Saumaise.¹⁸³ The Leiden scholars promised the author to devote themselves to a second, Amsterdam edition of *De unicornu*, and to send him additional classical references and descriptions of one-horned birds and insects from the New World. They kept their promise. 184 On the basis of reasoning by analogy, collectors sought the unicorn for a long time. The importance of an exegetical problem that was crucial in this context—that of whether the Hebrew word re'em should be translated as 'unicorn'—will be discussed later.

We can draw several conclusions from this survey of the collections of Brinck, Colvius and De Laet. They show once again that some Dutch humanists were very interested indeed in collecting *naturalia*. The fascination with other cultures and languages is striking. In this

¹⁷⁹ Olai Wormii epistolae II, nr. 841; OBI I, 115; Bekkers, Correspondence; Catalogus bibliothecae... Joannis de Laet.

¹⁸⁰ Shepard, Lore of the Unicorn, 155.

¹⁸¹ Schepelern, Musaeum Wormianum, 278-279.

¹⁸² Bartholinus, De unicornu observationes novae; Shepard, Lore of the Unicorn, 176.

¹⁸³ Olai Wormii epistolae II, nr. 716.

¹⁸⁴ Bartholinus, De unicornu observationes novae. Secunda editio.

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respect their collections are strongly reminiscent of those of Paludanus and Leiden University. All the same, there seems to be at least one important difference. While the earlier collections in Holland paid considerable attention to *naturalia* that illustrated classical and particularly biblical histories, there are few indications of their presence in the collections of Colvius and De Laet. In other words, while in Enkhuizen and Leiden the chronological and geographical dimensions formed an indivisible whole, the collections of Colvius and De Laet appear to display a distinction between present and past. The collections no longer told the story of Moses and the evangelists; they were about remote countries, foreign cultures, incomprehensible languages and plants and animals that had never been seen before.

Remote countries, ancient languages and biblical chronology

The collections of Colvius and De Laet seem to be illustrative of a general shift within the collections of curiosities. In many well-documented collections in Holland in the second half of the seventeenth century, *naturalia* connected with history in general, and biblical history in particular, were conspicuously absent.¹⁸⁵ A gradual shift of emphasis appears to have taken place within the collections. Their referential character became less complex, and we can detect a growing interest in contemporary *naturalia* from the Old and New World at the expense of items that were understood in terms of a textual framework.

If we try to account for this change, several hypotheses are possible in the cases of Colvius and De Laet. Both scholars were champions of the reformed religion, and may have regarded the collecting of fragments of Egyptian figurines of idols, relics, or stones from holy mountains as smacking of idolatry. However, there seems to have been more to it than just a disapproval of superstitious practices. Such items as the teeth of Behemoth, parts of Leviathan, mummies, or papyrus, which played such a major role in Mosaic physics, were apparently absent from the collections even though there was nothing about them to elicit Protestant censure. The role of the Bible and classical texts as the key to the interpretation of the curiosities in collections seems to have dwindled in importance. The cabinets of curiosities gradually lost something of their intertextual character; words became detached

¹⁸⁵ Cf. Smit ed., *Hendrik Engel's alphabetical list*; Bergvelt and Kistemaker eds, *Wereld binnen handbereik*, 313–334.

from things. It is tempting to attribute this change to progress in natural science in the seventeenth century. After all, both Colvius and De Laet were well informed about the works of Bacon and Descartes.

These new philosophers of nature may well have exerted an influence on De Laet and, in particular, on Colvius, who was on friendly terms with Descartes. However, it is questionable whether this is the whole story. Neither Colvius nor De Laet appealed to the two heralds of the new science anywhere. Both philosophers, however, were critical of the canon, and this may indicate where the answer is to be found. It is significant that both Colvius and De Laet studied in Scaliger's Leiden, and both men were fascinated by ancient languages, exegesis and the status of the classics. They were both very closely involved in one of the most striking consequences of the search for ancient texts, foreign languages and unfamiliar naturalia: the rise of textual criticism and, more particularly, of radical biblical criticism. The key figures in this respect included La Pevrère, Saumaise and the latter's pupil Isaac Vossius; all three of them raised questions about the authority of the Bible in relation to the chronology of world history, and it is interesting to note that the same trio were in direct contact with Colvius and De Laet.

On the authority of Scaliger, it was accepted pretty generally until the middle of the seventeenth century that the earth was created on Sunday 25 October 3950 BC. 186 The Creation, Fall, Flood and Babel provided the temporal, precisely dated framework within which the history of the Judaeo-Christian and heathen peoples could be understood. Important questions within the culture of collecting such as the names of things, the antiquity of mummies and the diffusion of peoples, languages and animals were all interpreted on the basis of the biblical chronology. However, contact with the non-Western world at the beginning of the seventeenth century raised problems in this respect. Egyptian, Mexican and Chinese sources, in so far as they were decipherable, prompted debate within a small circle because their history seemed to predate Adam and Eve. The flood of information about non-Western peoples shook the conviction that all peoples, languages and animals could be derived from the Garden of Eden. 187 Had Moses

¹⁸⁶ Grafton, 'Rise and Fall'; Idem, Scaliger II.

¹⁸⁷ Allen, Legend of Noah; Klempt, Säcularisierung; Grafton, New Worlds, Ancient Texts; Hamlin, 'Between Scepticism and Early Ethnography'; Jorink, 'Noah's Ark Restored (and Wrecked)'.

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and the heathen students of nature been familiar with armadillos, llamas, birds of paradise and colibris? Had there been a place for them in Noah's Ark? Were the Amerindians one of the lost tribes of Israel? Did all the languages in the world go back to Hebrew?

It is extremely interesting in this connection that Colvius' fatherin-law, Abraham van der Mijle-Colvius had married his daughter Anna—wrote a book in the 1620s in which all of these burning issues were discussed, although his cautiously formulated De origine animalium et migratione populorum was not published until 1667. 188 Van der Mijle is an exponent of the influential group of Dutch theologians who studied philology and natural history partly for pious reasons. 189 Among the preacher's friends were Lansbergen and Hondius, as well as Gerardus Vossius and Hugo Grotius, both of whom wrote favourably about the manuscript of *De origine*. ¹⁹⁰ Van der Mijle pointed out the potentially problematic status of the peoples, languages and fauna of the New World and tried to resolve the problem by means of a complicated pattern of migrations. Ultimately, he wrote, everything went back to the Fall and Babel. This was how Van der Mijle filled in the gaps indicated by Clusius, De Laet and others between the biblical and classical sources, on the one hand, and contemporary travel accounts, on the other. The problem may have been resolved, but it was indicative of a growing concern about the status of the classical natural histories and the Bible as the key to world history. Colvius must have been aware of the problems with which his father-in-law, who died in 1637, had wrestled. In 1656 Maresius stated, in the significant context of his criticism of the Pre-Adamite theory, that Van der Mijle's manuscript was in the library of the Dordrecht preacher. 191

While *De origine* remained unpublished, a very heated debate on the problems it tackled broke out in the 1640s, partly as a result of La Peyrère's *Prae-Adamitae*. Although this work was published in 1655, it had circulated in manuscript form for more than fifteen years. Down to the year of publication, La Peyrère continued to support the central thesis of his work with material that he derived to a large extent from two loyal correspondents: Ole Worm and Claude Saumaise. Worm

¹⁸⁸ Meertens, Letterkundig leven, 334–340; Hooykaas, 'Van der Mijle'.

¹⁸⁹ Meertens, 'Abraham van der Mijle'.

¹⁹⁰ Meerten, Letterkundig leven, 405 note 687.

¹⁹¹ Maresius, Refutatio fabulae prae-adamitica, 223.

sent La Peyrère a good deal of information about non-Western peoples, including those of the New World, while letters from Saumaise provided him with so much information about non-biblical chronologies that he remarked later that the Leiden scholar had been the midwife of the Pre-Adamites.¹⁹²

The controversy between Hugo Grotius and Johannes de Laet on the origin of the Amerindians went back to the theory of La Peyrère. After Grotius had been forced to leave the Dutch Republic and had been appointed as ambassador of Sweden in France, he gained access to La Peyrère's manuscript in Paris in 1642 and immediately realised the enormous implications of the Pre-Adamite theory for established religion. 193 To counter La Peyrère, Grotius fell back on various sources, including the manuscript of Van der Mijle' De origine. Grotius believed that the traditional biblical chronology could be saved and the Pre-Adamite menace defused by incorporating the problematic peoples of the Americas in the history of the general diffusion of languages and peoples narrated in the book of Genesis. His Dissertatio de origine gentium Americanarum (1643) was in fact the first open attack on La Peyrère, before the latter's work had been published. Grotius attempted to back up his theory with fairly superficial linguistic and cultural parallels. Following Van der Mijle, he argued that the Amerindians were of Northern European origin and had migrated to America from there. The striking similarity between the Mexican suffix -lan (Cimatlan, Coatlan, Quaxutatlan, etc.) and the German suffix -land (IJsland, Groenland, Estotiland) was one of the pieces of 'evidence' that he deployed. De Laet immediately responded to what he regarded as a completely ungrounded theory. The result was a bitter polemic which was fought out using many arguments with varying degrees of relevance. 194 De Laet completely demolished Grotius' work in his Notae ad dissertationem Hugonis Grotii (1643). The Leiden polyglot gave Grotius a long lesson in European and American philology. The Amerindian languages did not betray the slightest affinity with Hebrew, Greek, Latin or any contemporary European language. 195

¹⁹² Popkin, La Peyrère, 10-11.

¹⁹³ *Ibid.*, 6

Rubies, 'Hugo Grotius' Dissertation'; Schmidt, 'Space, Time, Travel'; Nellen,
 Hugo de Groot, 550-555.
 De Laet, Notae ad dissertationem Hugonis Grotii, 34-35.

Instead, De Laet emphasised the enormous differences between the European and Amerindian languages and cultures, not to mention the highly diverse flora and fauna. De Laet was less clear about where the people, animals and plants in the New World had come from. In the following decades this was to become a gigantic intellectual problem, especially after the publication of La Peyrère's *Prae-Adamitae* in Amsterdam in 1655, which referred to the dispute between Grotius and De Laet. ¹⁹⁶ La Peyrère openly defended the notion of polygenesis and rejected the monopoly of the Bible as the key to world history. Probably unintentionally, then, through his very close relation with Worm and Saumaise and his polemic with Grotius, De Laet will have indirectly contributed to a climate in which Pre-Adamitism could flourish, although he did not live to witness the greatest commotion as he died in 1649.

However, La Peyrère had based his bold theory more on common sense than on philological expertise, since he was not able to read the original Hebrew and Greek texts of the Bible.¹⁹⁷ Someone who was well able to do so was well known to Colvius. De Laet and Saumaise: the omnipresent Isaac Vossius. His controversial De vera aetate mundi (1659) can be regarded as one of the most important expressions of radical biblical criticism of the seventeenth century. 198 This polemical work, which was issued as a pamphlet, has to be seen in the light of the background of the controversy between Grotius and De Laet. As secretary of the Swedish ambassador, Vossius had been close to the fray.¹⁹⁹ He was fascinated, if not obsessed, by foreign countries and geography. 200 Like De Laet and Colvius, he kept a close watch on the flood of information, writings and artefacts from East and West, particularly from China, a country that he admired intensely.²⁰¹ The antiquity of China, emphasised in the extremely influential works of the Jesuit Martino Martini, the Atlas sinensis (1653) and the Sinicae historiae (1658), would play an important role in the ensuing debate.

¹⁹⁶ La Peyrère, *Prae-Adamitae*, 420; Jorink, "Horrible and Blasphemous".

¹⁹⁷ Grafton, Defenders of the Text, 204-213.

¹⁹⁸ Grafton, 'Isaac Vossius, Chronologer'.

¹⁹⁹ Lebram, 'Streit'; Blok, Vossius, 191-192.

²⁰⁰ Davids, 'In the Shadow of Jesuits'.

²⁰¹ Pinot, *La Chine et la formation de l'esprit philosophique*, 202; Katz, 'Chinese Jews'; Weststeijn, 'Spinoza sinicus'; Idem, 'Vossius' Chinese Utopia'.

According to Vossius, the Chinese were the most learned people in the world: 'In their writings and chronologies they had a continuous history of 4,500 years. There are some among their writers who are older than Moses himself.²⁰² It was an unprecedented claim. On the basis of different versions of the Old Testament, sources from the New World and ancient China, the latter recently published by Martini, Vossius argued that the earth must be considerably older than Scaliger and others had claimed, namely 1440 years to be precise. He went on to conclude that the original text of the Pentateuch had been lost. What we now have, the philologist argued, is not the original text written by Moses but at most a copy of a copy of a copy of a transcript, in other words, an extremely corrupt text. In passing, this and subsequent treatises by Vossius touched on other sacrosanct issues too. Had the Flood been universal? Vossius considered that impossible. There were references to this event in the chronicles of both Christian and non-Christian cultures, but they were hard to reconcile chronologically. Besides, he considered, there was not enough water to flood the whole earth at one time. A related problem was that of how all the animals that were unknown to the ancient world had reached the New World. Vossius also rejected the firm conviction of many theologians that Hebrew was the prediluvian language: it was impossible to derive all the languages of the world from the pre-Babylonian period.²⁰³

In other words, partly as a result of the thirst for curiosities from East and West, philological expertise, internal and external biblical criticism, the status of the Bible was called seriously into question. A growing knowledge of ancient texts led, paradoxically, to scepticism rather than certainty. Vossius claimed in no uncertain terms that the Bible did not tell a universal history, but was just the historically and geographically limited story of a single people. He has gone down in history as one of the pioneers of biblical criticism, but his views did not go unchallenged and the rather tactless philologist was accused of opening the door wide to atheism. In the face of all the criticisms, Vossius presented a systematic exposition of his exegetical views in a voluminous and erudite work, *De septuaginta interpretibus*.²⁰⁴

²⁰⁴ Mandelbrote, 'Isaac Vossius and the Septuagint'.

²⁰² Vossius, Discours, 39.

²⁰³ Vossius, Appendix ad librum de LXX interpretibus; Idem, De septuaguinta interpretibus.

Interestingly, this book incorporated an open letter to Andreas Colvius in which the ignorance of Vossius' opponents was given a thorough trouncing. Ossius expounded his objections to the traditional biblical chronology and the ensuing views on the diffusion of peoples, languages, animals and plants in this *Epistola* and in unpublished correspondence with Colvius. They were thorny issues which provoked heated debates all over Europe from the 1650s on. Colvius was thus involved in this debate from the start. Not only did he know Van der Mijle's *De origine*, but he also closely followed the debate between Grotius and De Laet and later studied the writings of his friend Vossius. In short, Colvius was well aware of the crumbling worldview and problematic status of the textual tradition.

Exactly the same can be said of Joannes de Laet. He did not live to see the commotion provoked by La Peyrère's Prae-Adamitae and Vossius' De vera aetate mundi, but he had already expressed his opinion that the New World was unknown to antiquity.²⁰⁷ The scholarly world gradually became aware of the relativity of the concepts of time and space. De Laet regarded classical texts and the contemporary fauna and flora of America as two separate matters. His edition of Pliny's Naturalis historia (1635) is characterised by a strict philological approach; it has become a historical document in which a distinction is drawn between past and present.²⁰⁸ Nowhere does he mention the immediate applicability of the Plinian text. This tendency is even clearer in De Laet's book on minerals, *De gemmis et lapidibus libri duo* (1647). De Laet justified this work in the preface by pointing out all the nonsensical claims that had been made based on the corrupt manuscript tradition of mineralogical texts.²⁰⁹ The book constantly draws a sharp distinction between the ancient world (antiqui) and the present (nos hodie).²¹⁰ The traditional reflections on the latent powers of minerals have been replaced by a down-to-earth description of what De Laet has himself seen.

²⁰⁵ Vossius, *De septuaginta interpretibus*; Idem, *Ad Andream Colvium epistola*, in: *Ibid.*, 383–410; BLO Ms d'Orville 470, fol. 79.

²⁰⁶ UBL Ms BUR 11 I, fol. 49/v.

De Laet, Nieuvve Wereldt, **/r.

²⁰⁸ (Pliny), Caius Plinius Secundus. Historiae naturalis Libri XXXVII. Curante Joanne de Laet.

²⁰⁹ De Laet, De gemmis et lapidibus libris duo, *3/r.

²¹⁰ See for example: *Ibid.*, 7, 8, 21, 23, 71.

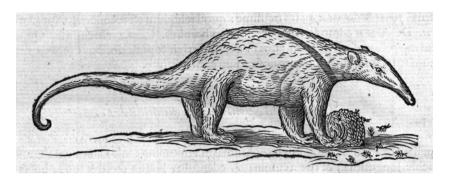


Fig. 50. Based on a drawing by Georg Marcgraf, this engraving of an ant eater was included in the *Historia naturalis Brasiliae* (1648). It was one of the many creatures unknown to the ancients (KB).

This approach is also one of the more interesting aspects of the *His*toria naturalis Brasiliae (1648), which De Laet edited. This, the first natural history of South America, was the result of Johan Maurits van Nassau's stay in Brazil. Willem Piso (1611-1678) and Georg Marcgraf (1610-1644) had meticulously charted the natural history of Brazil, and it was De Laet's task to arrange, supplement and publish their record. The Historia has been characterised by William Ashworth Jr as one of the works that mark the watershed in the way that natural history was practised in the early modern period.²¹¹ The term 'watershed' and related concepts like 'shift in paradigm' or rupture épistémologique are too schematic to do justice to the stubborn facts of history but, if used with caution, they might be helpful as indicators to long-term trends. While Gessner, Aldrovandi and their followers had made textual references an integral part of the description, they were lacking in the *Historia*. Anteaters and sloths were not to be found in the Bible, nor in Aristotle, Pliny and the Physiologus. They were animals without history, creatures without a story, of which scholars could only record the anatomy and behaviour. The traditional fitting of all information into an etymological and emblematic context had become rather problematic.

If we return, after this long digression through Babel, China and the New World to the question with which this section began, namely the suspicion that the textual tradition played a minor role in the

²¹¹ Ashworth, 'Natural History', 318.

collections of Colvius and De Laet, we are bound to note that they were both closely involved with the emergence of a new historical awareness. The conviction, initially shared by many scholars, that the works of antiquity had universal validity and that the Bible narrated the history of the entire created world gradually made way for a historicised interpretation of the canonical sacred and profane texts and a calling into question of their scope. It was a long process. Besides the gradual undermining of such authorities as Pliny and Aristotle, Casaubon's exposure of the *Corpus Hermeticum*, La Peyrère's *Prae-Adamitae* and Vossius' *De vera aetate mundi* were the most striking manifestations of this development. Travels of discovery, philology and natural history proceeded hand in hand. The European hunger for curiosities, originally partly intended to illustrate classical and Christian history, began, paradoxically enough, to undermine that very history.

Humanist collectors had allowed the Trojan horse inside. As has been pointed out in various quarters, this process had extremely important consequences for the way in which nature was viewed in the seventeenth century.²¹² In his widely cited article 'Natural History and the Emblematic Worldview', Ashworth puts it rather polemically but probably correctly as follows:

The Scientific Revolution was, after all, itself a historical revolution. It changed forever the way we would view Aristotle, Ptolemy, Galen. It altered the very concept of historical process. It is no simple coincidence that scientists of the seventeenth century developed keen interests in such matters as the origins of language, the early geological history of the earth, the settlement of the New World, the chronology of Egyptian and Chinese history, the collection of fossils, the early history of Christianity. ²¹³

In the background, this process of growing historical awareness played an important role in the composition of the cabinets of curiosities in the Netherlands. The collections down to the end of the sixteenth century pointed in all directions, in both space and time, and were embedded in a textual framework. In the course of the following century the interchangeability between *res* and *verba* that had been taken for granted in the past was gradually called into question.

²¹² See for example Grafton, Defenders of the Text; Idem, New Worlds, Ancient Texts; Slaughter, Universal Language and Scientific Taxonomy.

²¹³ Ashworth, 'Natural History', 324.

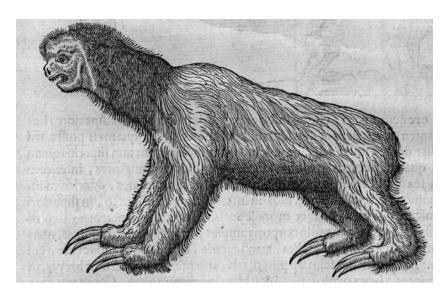


Fig. 51. Another creature from the West Indies, as depicted in the *Historia naturalis Brasiliae* (1648): the sloth. Although a better representation was available, the publisher re-used the engraving of Clusius' *Exoticorum libri decem* (1605) (KB).

3. From collection of curiosities to cabinet of naturalia

The change to which the composition of the cabinets of Colvius and De Laet bears witness is symptomatic of a general shift in interest that was also shared by less erudite collectors in the Dutch Republic. The impression that we gain from the sources is that the same kinds of *naturalia*, *artificialia* and ethnographic items were to be found in every collection of importance around 1665.²¹⁴ The presence of these artefacts was probably dictated by intellectual developments and certain conventions, on the one hand, and motivated by practical considerations, such as the influx of exotic items from East and West, on the other.

A good illustration of the composition of one of these cabinets is provided by that of the Amsterdam merchant Jan Volkertsz (1578–1651),

²¹⁴ Smit ed., *Hendrik Engel's alphabetical list*; Bergvelt and Kistemaker eds, *Wereld binnen handbereik*, 313–334.

which was continued by his son Volkert Jansz (ca. 1610–1681).²¹⁵ From the travel account of Christiaan Knorr von Rosenroth (1663) we know that this collection contained works of art and utilities from the Indies; shells, minerals and animals. Of course, the almost obligatory items such as some monstrously disfigured animals, an armadillo, a remora, the hand of a mermaid, and the bird of paradise ('its feet are minute', Rosenroth cautiously added) were present too.²¹⁶ In spite of the absence of explicit biblical allusions, poetically inspired visitors were impressed with pious sensations by the collection. The Dordrecht poetess and *savante* Margreta Godewyck (1627–1677) wrote that she recognised the 'finger of God' in this cabinet.²¹⁷ Her Amsterdam colleague Jan Zoet (1609–1674) expressed himself in similar terms. In a poem in honour of Volkertsz, an 'exceptional lover of divine wondrous works', he called this collection of curiosities 'a book in which God has gloriously described himself'.²¹⁸

These poets seem to have been of more or less like mind: the rarities are manifestations of God's creative almightiness, they are the 'letters that enable us to contemplate God's invisible things'. 219 But unlike the collections formed half a century earlier, admiration was provoked not by the biblical or symbolic references, but by the astonishingly multifaceted nature of the contemporary world. Attention shifted towards order, regularity, structure. This process of transformation was longlived, and although all kinds of differences can be found at the level of detail, there is still a world of difference between the collections of curiosities of Paludanus and Leiden at the end of the sixteenth century, on the one hand, and the cabinets of naturalia of Vincent and Seba at the beginning of the eighteenth century. Still, collections did not lose their religious connotation. The unravelling of the textual element was more than compensated by the increasing emphasis on God's master plan, as revealed in the creation and demonstrated in the collections. A pioneering role in this process was played by Johannes Swammerdam. The transformation from collection of curiosities to cabinet of *natura*lia took place in the 'De Star' apothecary in Amsterdam.

²¹⁵ Smit ed., *Hendrik Engel's alphabetical list*, 292; Van der Veen, 'Dit klain vertrek', 232, 331; Van Eeghen, 'De staalmeesters'.

²¹⁶ HAB Ms Extr. 253.1, 'Itinerarium Christian Knorr von Rosenroth', fols 93–96; Fuchs and Breen, 'Aus dem *Itinerarium*'.

²¹⁷ OAD Hs 1024, fols 81-82, 'Op 't cabinet van Johan Volckersz'.

²¹⁸ Zoet, d'Uitsteekenste digt-kunstige werken, 213.

²¹⁹ Bakhuizen van de Brink, Belijdenisgeschriften, 73.

The cabinet of Swammerdam senior

When Rosenroth visited Amsterdam in 1663, he inspected not only the collection of Jan Volckertsz, but also that of Johannes Jacobsz Swammerdam, Amsterdam apothecary, who lived on the Oude Schans near the Montelbaanstoren. 220 Swammerdam senior had started to collect around 1630. Partly thanks the favourable location of his house, near the harbour on the River II and the storehouses of the Dutch overseas trading companies, he was able to amass a collection that far exceeded the common stock of an apothecary. Swammerdam senior's collection was famous, and thanks to the comments by such travellers as Rosenroth, Borch and De Monconys, we can form a detailed picture of the curiosities that he collected.²²¹ That picture is complemented by the catalogue that his son compiled in 1679 after his father's death, Catalogus musei instructissimi. Numbering some 6,000 items arranged in 27 cabinets, this was a large collection. If we follow the catalogue drawn up by Swammerdam junior, they appear to have been arranged in categories. If we survey the collection as a whole, several striking features emerge.

First is the presence of the familiar *naturalia*: four birds of paradise (three with feet, one without), the hide of a Tartary lamb and wool spun from it, the hand of a mermaid, the horn of a unicorn (from a fish in the waters of the North, the sources add). There were also the usual praeternatural items such as a stone 'in which a cross has been engraved by nature', and shells on which letters in Arabic and Hebrew could be seen, including one with the word *Elohim*.²²² If Scaliger had still been alive, he would certainly have come to Amsterdam to see it. The apothecary also had a vast quantity of exotic *naturalia* that had nothing abnormal about them: shells, corals, ores, minerals and dried fruit. Perhaps indicative of the interests of collectors in Holland is the presence of a six-foot Chinese almanac.²²³

In short, the collection of the Amsterdam apothecary is strongly reminiscent of that of Paludanus (from whose collection Swammerdam

²²⁰ HAB Ms Extr. 253.1, 'Itinerarium Christian Knorr von Rosenroth', fol. 100; Fuchs and Breen, 'Aus dem *Itinerarium*', 231–239.

²²¹ OBI II, 79–81; De Monconys, Journal des voyages II, 171.

²²² OBI II, 80; HAB Ms Extr. 253.1, 'Itinerarium Christian Knorr von Rosenroth', fol. 103; Fuchs and Breen, 'Itinerarium', 232.

²²³ [Swammerdam], Catalogus, 58.

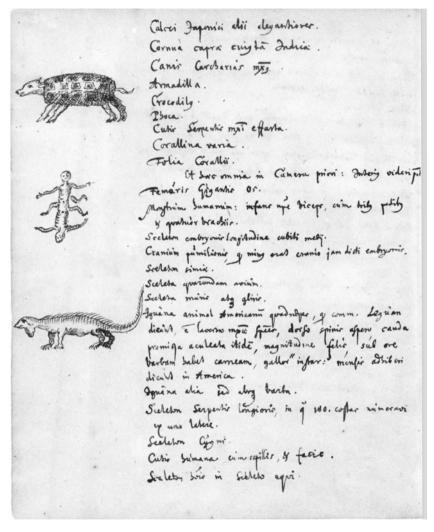


Fig. 52. In 1663, the German scholar Christian Knorr von Rosenroth visited some cabinets in Amsterdam. In the collection of Jan Volkertsz, he took these notes, including sketches of an armadillo and of a two-headed monster (HAB).

senior owned gold ore).²²⁴ Yet we can also see the main difference from Paludanus and the Leiden anatomical theatre: Swammerdam had almost none of the antiquities, devotional objects and biblical *naturalia* that had formed such a prominent part of the collections in Enkhuizen and Leiden. The emphasis in the collection of Swammerdam senior was still on the anomalous, exotic and bizarre, but at the same time it contains elements that look forward to future developments. Swammerdam senior also had a number of insects; not only insects with symbolic significance such as locusts, butterflies and a stag beetle, but also an everyday 'tree beetle', a 'bumble bee' and a 'cockroach', as well as 'a magnifying glass with its copper and accoutrements'.²²⁵ The presence of the latter is no doubt due to the interests of his son.

Johannes Swammerdam: the order and structure of God's works

When Rosenroth visited the collection of Swammerdam senior in 1663, the latter's son Johannes was in lodgings in Leiden, where he was studying medicine. He must have fed his eyes to his heart's content on the botanical garden and the anatomical theatre, and probably made up his own mind about the curiosities they contained. The collections of both institutions had been marked by the shift from text to contemplation in the first decades of their existence, but afterwards they failed to keep up with the rapid contemporary developments. Around 1660 they were in essentials no different from what they had been half a century earlier, and served more as a tourist attraction than as demonstration material for the latest insights in the natural sciences. 226

However, pioneering research was still going on, but no longer in the anatomical theatre. Instead, it was conducted in the operating theatre of the municipal Caecilia hospital (today's Museum Boerhaave) and in private sessions in the homes of professors. Swammerdam was one of a group of young students, supervised by Dele Boë Sylvius and Van Horne, who excelled in the dissection of humans and animals. The emphasis was no longer on contemplating skeletons, mummies

²²⁴ Ibid., 5.

²²⁵ *Ibid.*, 30, 71.

²²⁶ Catalogus van alle de principaelste rarieteyten; Witkam, Catalogues; Van Berkel, 'Institutionele verzamelingen'.

and exotica, but on the finer anatomy of humans, dogs and frogs.²²⁷ This group has gone down in history as one of the founders of comparative anatomy. Swammerdam began privately with the building up of a collection of anatomical specimens and insects. When Borch visited him in Leiden in 1662, he could already compile an impressive list of *rariora*.²²⁸ Thanks to his collecting fever and the revolutionary techniques that he used to prepare specimens, Swammerdam's collection grew rapidly while he was studying in Leiden and France.²²⁹ In 1669 it contained 1,200 items, and it would eventually comprise no less than 3.000.²³⁰

Swammerdam's collection was already famous before the publication of the *Historia generalis insectorum* (1669). He was very honoured by a visit from Cosimo de' Medici in June 1669. Later, during Swammerdam's religious crisis in 1674, the prince offered him 12,000 guilders for the collection, on condition that Swammerdam settle in the Florentine court (and convert to Catholicism, the evidence available suggests).²³¹ The prince's offer was turned down, but might be indicative of the importance that was attached to the collection.

Seventeenth-century collections of curiosities could be seen from different perspectives. The significance of an object was not an inherent, objective given, but was highly dependent on how it was interpreted. Most of the visitors to collections like that of Swammerdam senior will have been overwhelmed by the enormous variety and the many spectacular items, and as they wandered past the cabinets they will have superficially examined the artefacts on display or seen a connection between them and biblical and classical knowledge. But Swammerdam did something fundamentally different. He isolated incidental items such as corals, shells and insects and placed them under the microscope to study their astounding anatomy. In investigating his father's shells, he did not speculate about the traces of the word of God that could be read on them, but confined himself to a down-to-earth description of their remarkable structure:

²²⁷ Lindeboom, 'Dog and Frog'; Huisman, Finger of God, 76-98.

²²⁸ *OBI* II, 241.

²²⁹ Ibid. IV, 121, 323.

²³⁰ Swammerdam, Historia, 168; Idem, Bybel, 534.

²³¹ Jorink, 'De profeet en de boekhouder'.

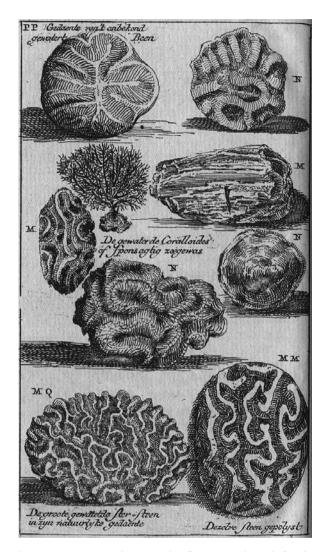


Fig. 53. Johannes Swammerdam is chiefly remembered for his study of insects, but he was fascinated by other creatures as well. In Boccone's *Recherches et observations* (1674) he published his research on corals and sponges (KB).

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And this is how practically all shells are composed, however strangely they may be spiralled and made: I have investigated many and different sorts that are in my father's cabinet.²³²

From this and many other passages we can see how Swammerdam constantly sought unity in diversity, the underlying 'order and rules' that dictated the anatomy of all creatures. 'All God's works are based on the same rules', Swammerdam repeated time and again.²³³ This axiom was to have an enormous influence on the practice of natural science and the culture of collecting. For Swammerdam, classical references and symbolic meanings were hardly relevant any longer. Knowledge did not come from reading books, but by investigating the 'Bible of nature' itself. Texts about nature were corrupt and unreliable. Like Isaac Vossius, who was no longer satisfied with unreliable copies for studying the Bible, Swammerdam wanted to return to the *Urtext*: the world of nature as perceived by the senses.

The greatness of the 'Supreme Creator' was revealed to Swammerdam in the infinitely refined structure of the whole creation.²³⁴ That regularity was visible in the internal and external anatomy of every living being, irrespective of status, nature and provenance. This view had enormous consequences for the culture of collecting curiosities. Swammerdam assigned all creatures the same ontological status; the distinction between normal and abnormal, large or small, beautiful or ugly, rare or common, was no longer relevant. As Swammerdam saw it, searching for anomalies in the hope of understanding the essence of the creation in this way was a fruitless enterprise. It was not the collecting and describing of individual entities, but the analysis of general processes—the anatomy and generation of insects—that led to wonder at God's creative almightiness, and thus to true knowledge and piety. Philosophers of nature like Swammerdam, Galilei, Descartes, Hooke and Grew who wanted to derive the course of nature from a limited number of basic rules regarded the whole concept of collections of curiosities as an epistemological curiosity.²³⁵

In his work, Swammerdam tried to describe and draw only what he had himself investigated. This too had major consequences. Although previous collectors had already demonstrated some critical sense and

²³² Swammerdam, *Bybel*, 142. See also *Ibid.*, 145, 149.

²³³ See for example Śwammerdam, *Historia*, 'Naa-reeden', 5.

²³⁴ Ibid., 'Aan den leser', 3.

²³⁵ Cf. Daston, 'Neugierde'; Vermij, 'Wetten der natuur'.

emphasised the importance of empirical inquiry, no one went as far as Swammerdam. He only believed and wrote about what he had seen with his own eyes and had preferably dissected himself too. The best example of this approach is Swammerdam's refutation of the theory of spontaneous generation, but elsewhere in his work we find other sarcastic swipes at other 'fables' in natural history. The naturalia from his own or his father's collection were not only the starting point for research, but also its final point: the collection stood at the beginning and the end of the heuristic process. For example, after his revolutionary exposition of the stages of propagation of some insects, he remarks: 'we have some pupae, flies and plants that are very rare, which we keep and can show to the glory of the wondrous works of inexhaustible nature'. 236 Anyone who did not believe him could come and see for himself. Of course this was a rhetorical device: hardly anybody was capable of checking Swammerdam's pioneering work by paying a visit to the researcher. In principle, his public just had to believe what it read or saw in the engravings, which were often incomprehensible without the explanatory text. Still, in essence we can see that Swammerdam's theory and practice summarised the whole of seventeenth-century scientific development in a nutshell: the shift from the abnormal to admiration of the commonplace. 'We still have a kind of marine woodlouse which we found in salt water' is a characteristic opening to one of Swammerdam's anatomical exercises.²³⁷ Wonder at the nature that was visible to every person in the Netherlands was of crucial importance.

We can reconstruct Swammerdam's collection from several sources. As he wrote to Thévenot, the collection had been built up with 'much work, sleepless nights, travel and trouble'.²³⁸ He had largely overcome the problems of conservation that had driven previous anatomists and collectors to despair. The insects in his collection were collected by Swammerdam himself and by his learned friends.²³⁹ He also liked to reciprocate by sharing his findings with others. For instance, the Royal Society was 'well-pleased' with the box of anatomical specimens that it received from Swammerdam in 1672 for its Repository.²⁴⁰

²³⁶ Swammerdam, *Historia*, 157, italics are mine.

²³⁷ *Ibid.*, 82.

²³⁸ Lindeboom, Letters, 83.

²³⁹ Ibid., 148.

²⁴⁰ Birch, History of the Royal Society III, 71.

Swammerdam kept a large number of boxes of insects in his cabinet. Generally speaking they were grouped by category: moths with moths, beetles with beetles, mayflies with mayflies.²⁴¹ For each class, Swammerdam arranged the 'bloodless creatures' not only by sort, but also according to the different stages of their development. He also had a 'four-storey' wasps' nest and eighty-eight drawings of exotic insects, as well as a large number of anatomical specimens, ranging from a foetus in spirit to a rat's testicles, and from a human lung to 'the incipient teeth of a lamb embryo'.²⁴²

These were all rarities as well, but the context in which they have to be understood is nevertheless essentially different from that of the earlier cabinets, although a word of caution is called for. Swammerdam's cabinet has been anachronistically regarded as a purely scientific instrument and his collection as intended solely to prove a scientific theory. Swammerdam himself, however, left no room for doubt on this score: he believed that there was an intrinsic connection between science and religion. For instance, in a letter to Paolo Boccone (1633–1704) published in 1674 he wrote:

All the rarities that I have investigated so far I keep in their entirety on pieces of glass, in order to sometimes entertain some friends who love to study and are eager to continue these pleasant and excellent investigations, which the divine architect of the universe who is worthy of adoration, shows to us at every moment, although they are nevertheless concealed so deeply in his works that we are constantly obliged to confess that we only observe the shadows of his uncountable wonders.²⁴⁴

Collecting, observing, analysing, classifying, describing and drawing creatures was a form of worship for Swammerdam. Collectors who worked in a sloppy fashion like Goedaert, or those who collected curiosities in foreign countries for motives of profit instead of piety, were virtually heretics.²⁴⁵

Among those who visited Swammerdam was Christiaan Huygens. Although Swammerdam was not well, Huygens did not leave before having seen his collection. Swammerdam told Thévenot that Huy-

²⁴¹ Gruber, Commercii epistolici Leibnitiani, 1349.

²⁴² Le Cabinet de Mr. Swammerdam, passim.

²⁴³ Van der Veen, 'Dit klain vertrek', ²⁴⁸; Wettengl ed., *Merian*, 25.

²⁴⁴ Boccone, *Recherches et observations naturelles*; here quoted after the Dutch translation, *Natuurkundige naspeuringen*, 157.

²⁴⁵ See for example: Swammerdam, *Bybel*, 152.

gens had been astonished at what he saw. 246 Huygens sent enthusiastic reports to the Royal Society, which made attempts around 1676 to acquire the entire collection. It is unclear why the transaction did not go ahead, but the interest shown is indicative. The Society was wrestling with the problem which faced every seventeenth-century collector sooner or later: an enormously expanding collection of the most diverse objects. What did people need to collect to obtain a good picture of the world of nature: separate entities, or the most characteristic of each sort? Anomalies or what was normal and commonplace? Exotica or domestic naturalia?²⁴⁷ We here find the same shift in thinking about the nature and purpose of collections as in the case of Swammerdam. In the printed inventory of the Royal Society, Museum Regalis Societatis (1681), Nehemiah Grew also shifted the emphasis from the strange to the everyday: 'It were also very proper, That not only Things strange and rare, but the most known and common to us, were thus describ'd'. 248 In making their descriptions, scientists should stick to visible facts and not drag in 'Mystick, Mythologik, or Hieroglyphick matters...as some have done'. 249 The tone was set, although practice did not always match theory.

In spite of its international reputation, Swammerdam's collection was never sold. After his death in 1680 it was dispersed. It is difficult to assess its historical value. On the one hand, it was so strongly marked by the personality of the owner and was so different in character from other seventeenth-century collections that it can be regarded as forming an exception. On the other hand, Swammerdam presents us with a long-term trend in the bud. Bono described this process as 'the turn of science in the seventeenth century from texts to things, from language to laboratory, from nature emblematized to nature laid bare'. ²⁵⁰

Frederik Ruysch: monsters in the margin

'Ruijs has established an anatomical cabinet', Swammerdam wrote to Thévenot in 1671, 'and exhibits it for payment'.²⁵¹ The cabinet of the Amsterdam anatomist and professor Frederik Ruysch (1638–1731)

²⁴⁶ Lindeboom, Letters, 57.

²⁴⁷ Hunter, 'Between Cabinet of Curiosities and Research Collections'.

²⁴⁸ Grew, Musaeum Regalis Societas, s.p.

²⁴⁹ Ibid

²⁵⁰ Bono, Word of God, 272.

²⁵¹ Lindeboom, *Letters*, 63.

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grew to become one of the most famous in Europe and was purchased en bloc in 1717 by Peter the Great. After this sale the indefatigable 79-year-old anatomist set about creating a new collection. Ruysch was a celebrated scientist and maintained numerous international contacts.²⁵² Among his later appointments was that of Fellow of the Royal Society. When Cosimo de' Medici was travelling through Holland, he not only visited Swammerdam but also observed various dissections and other curiosities in Ruysch's house.²⁵³ Like Swammerdam, Ruysch had studied in Leiden under Dele Boë Sylvius and Van Horne and was also to excel later in anatomising humans and animals. The parallel with Swammerdam goes even further: Ruysch too made use of techniques—which he carefully kept secret—for making wet and dry specimens, though he took them from his former fellow student. Their characters were very different. While Swammerdam was inspired and took an ambivalent view of the world of knowledge and power, the hard-nosed Ruysch moved in that medium like a fish in water. Swammerdam was a genuine researcher who worked on the boundaries of knowledge, while Ruysch was much more focused on demonstration and conservation. And while Swammerdam, in spite of all his doubts and crises of conscience, eventually regarded science as exclusively to the greater glory of God, status and financial profit certainly also played a role for Ruysch. Still, in spite of the differences in their personalities, the organisation of Ruysch's cabinet was more like that of Swammerdam than those of other contemporaries.

Ruysch devoted five rooms in his home in Amsterdam to the exhibition of *naturalia*. He sometimes guided his pupils round the collection, but he also opened it to a wider public. Moreover, from 1701 he described his collection in ten richly illustrated catalogues.²⁵⁴ This was a novelty. Until then Dutch collectors had shown their possessions to a select public and only produced summary (manuscript or printed) inventories for their own use. Ruysch's project, however, was deliberately intended to offer a wider public a specific picture of the collection as such. That collection was divided among a number of separate cabinets (*thesauri*), each with a character of its own, and each described in

²⁵² Kooijmans, De Doodskunstenaar; Driessen, Kunstkamera, 118-131.

²⁵³ Hoogewerff, De twee reizen, 80-81.

²⁵⁴ Ruysch, *Thesaurus animalium primus*; inventory of Ruysch' visitors UBA Ms I E 20–21; Margócsy, 'Advertising Cadavers'.

a catalogue of its own. The catalogues (*Thesauri*) were often reprinted, translated and published separately or bound together.

The first striking feature is the absence of historical material.²⁵⁵ This was an enormous collection of human and animal specimens, insects, shells, corals and other *naturalia*. Like Swammerdam, Ruysch kept much of the material that he had himself dissected as illustrative material and evidence. The cabinets were arranged, as Ruysch put it, 'for the contemplation of the wondrous works of God Almighty'.²⁵⁶ However sincere or obligatory that remark may have been, it was certainly typical of the social conventions of his day. He anatomised and prepared all kinds of parts of human and animal bodies, exhibited them, described them, and had them illustrated. The emphasis here as well was on structure, order and regularity.

Ruysch's interest in monstrous births, for instance, was not motivated by the classical preoccupation with praeternatural matters, nor was it accompanied by comments about impending doom. He was convinced that there was a natural explanation for such malformations and saw in them the hand of God. 257 His attitude in this respect is indicative of the shift in European attitudes to monstra. Anomalies were now emphatically drawn within the domain of natural explanations in scholarly circles. The category of the praeternatural was slowly but surely eroded in the course of the seventeenth century. Teratological treatises also showed a shift from hermeneutic, interpretative accounts to a more descriptive, matter of fact approach, which equally provoked wonder.²⁵⁸ In Ruysch's case, wonder was evoked by the striking, but in essence entirely natural constitution of monsters. Microscopic investigation of capillaries, for example, led Ruysch to repeatedly exclaim in his scientific publications and private correspondence: 'O Almighty Lord, how wonderful art thou in thy works!'259

A similar sense of wonder emerges from Ruysch's fascination with a very unusual type of toad, the Surinamese pipa. This extremely

²⁵⁵ Luyendijk-Elshout, 'De moralistische betekenis'; Van de Roemer, 'Lichaam als borduursel'; Margócsy, 'Museum of Wonders or Cemetery of Corpses?'

²⁵⁶ Ruysch, Thesaurus animalium primus, *3/r.

²⁵⁷ Ruysch, Observationum anatomico-chirurgicarum centuria, 55; Idem, Alle de ontleed-, genees-, en heelkundige werken, 741, 754, 956.

²⁵⁸ Daston, 'Marvelous Facts'; Daston and Park, Wonder and the Order of Nature, 173–214.

²⁵⁹ BL Ms Sloane 4048 fols 112-113.

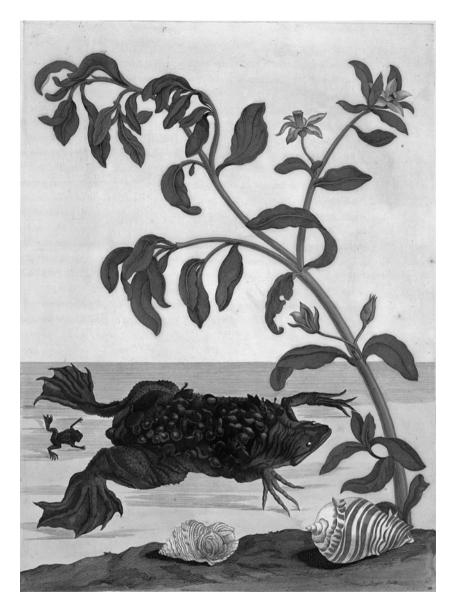


Fig. 54. One of the new wonders of the late seventeenth century was the *pipa*. Nicolaes Witsen was the first to obtain a specimen of this strange creature. This image is taken from Maria Sybille Merian's *Metamorphosis insectorum Surinamensis* (1705) (KB).

ugly amphibian was born from saccules on its mother's back after a very elaborate mating ritual. Nicolaes Witsen was the first to receive an exemplar in Europe in the 1680s.²⁶⁰ Ruysch soon obtained some exemplars too. It was such a fascinating creature that Dutch collectors received letters from their English colleagues begging for information, drawings and exemplars of the creature itself. Ruysch wrote in reply to such a letter from Petiver that he had two kinds, black and grey, but that he could not miss either of them; he also referred to the work by Merian in which the creature was illustrated.²⁶¹ The pipa soon came to occupy a place in every cabinet of *naturalia*, thereby replacing the birds of paradise or unicorn horn. Unlike the latter, however, no symbolic significance was attached to the Surinamese toad; it was its unusual form of propagation that was a source of wonder. The changing sensibility vis-à-vis curiosities is also clear from the fact that Ruysch's pipa was not admired from afar and did not feature in books of emblems, but ended up on the dissection table. His anatomical observations were eventually incorporated in the Description du pipa by his fellow collector Levinus Vincent, who emphasised that the 'incomprehensible power' of God was nowhere clearer than in this creature. 262

All this attention to the visible structure should not obscure the fact that Ruysch's collection did have a moralising function. The most striking parts of his cabinet bore the hallmark of his training in Leiden. More specifically, his collection is an updated version of the anatomical theatre that Pauw had set up. Although Ruysch, who was not particularly well read, did not share the obsession of Pauw's successor, Heurnius, for ancient languages and cultures, he did compose artistic tableaux in which child skeletons played the violin, blew bubbles, and bore such mottos as: 'the same hour that gave me life stole it from me'. One of the baby skeletons was holding a mayfly.²⁶³ The legs or heads of small children were decorated with batiste beads, and jars with birds or reptiles in spirit were closed with lids to which insects, shells or corals were attached. They were very eye-catching creations that played

²⁶⁰ See the letter of Witsen to the Royal Society, 25 February 1690, ARS LBC 11 (1) fol. 184; Ruysch, *Thesaurus animalium primus*, 19–20.

²⁶¹ BL Ms Sloane 4064, fol. 119; BL Ms Sloane 4067, fol. 127.

²⁶² Vincent, Descriptio pipae, a2/r.

²⁶³ Ruysch, Alle de werken II, 881.



Fig. 55. One of the more famous illustrations of Frederik Ruysch' *Eerste anatomisch cabinet* (1705): skeletons of children on a pedestal of corals and stones from galls and bladders. This ensemble is entirely in the tradition of the Leiden *theatrum anatomicum* (KB).

a large part in determining the look of Ruysch's collection, although recent research has shown that they were not in fact very representative of his collection.²⁶⁴

It may be concluded that Ruysch's rich collection illustrates the fluid transition from the collection of curiosities to the cabinet of *naturalia*. As in the case of the more radical Swammerdam, historical references were as good as absent. Although the traditional *vanitas* motif is still recognisable in Ruysch's collection, the emphasis had swung towards external structure, order and regularity.

4. Dutch collections around 1700

Dutch collections changed considerably in character in the course of the seventeenth century. The emphasis shifted from praeternatural and biblical *naturalia* to collections in which there was far more emphasis on the underlying natural order. The way in which collections were presented followed a parallel process from humanist *studiolo* to semipublic collection, 'from solitude to sound', as Findlen has characterised this process in the Italian context.²⁶⁵ This was of course no overnight change but a general tendency. Personal ideas played a large role, and it should not be forgotten that the contents of a cabinet are harder to date and more elusive than the text of a book.

How this process proceeded in the Dutch Republic can be demonstrated on the basis of three collections that were famous in their day: the collections of Nicolaes Witsen, Albertus Seba, and Levinus Vincent. Along with Ruysch, Merian, d'Acquet, Schijnvoet and others, they belonged to a large international network that exchanged information, artefacts and publications. The three men were members of the Royal Society, and their collections were among the most famous in Europe; Czar Peter the Great acquired both Ruysch's and Seba's collections. The catalogues, publications and correspondence of Witsen, Seba and Vincent enable us to form a picture of the scope, contents and religious dimension of their collections.

²⁶⁴ Van de Roemer, 'Lichaam als borduursel'.

²⁶⁵ Findlen, Possessing Nature, 109.

²⁶⁶ Van der Veen, 'Met grote moeite en kosten'; Van de Roemer, 'Neat Nature'; Van Gelder, 'Maria Sybilla Merian'; Jorink, 'Alle bedenckelijke curieusheden'; Schmidt, "Imperfect Chaos".

²⁶⁷ Driessen, Kunstkamera; Kistemaker e.a., Paper Museum.

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Nicolaes Witsen: between the Flood and Babel

The collection of Nicolaes Witsen well illustrates that the change in form and content of cabinets in the Netherlands was a slow and by no means linear process. The Amsterdam dignitary and governor of the Dutch East Indian Company owned a large and celebrated cabinet. Unlike those of his contemporaries Ruysch, Vincent and Seba, it was very closed in character, and followed the humanist tradition in being located in the library.²⁶⁸ Witsen knew Vossius, Swammerdam and Ruysch very well, but does not appear to have shared their scepticism regarding the textual tradition.

Witsen's disputation on comets and his collection of insects have already been mentioned as manifestations of his much wider fascination with the multi-faceted nature of the divine creation, of which his gigantic collection was the most tangible result. Various sources enable us to form an idea not only of the contents of his collection, but also of the ideas on which it was based.²⁶⁹ Witsen collected a lot himself during his travels in the Dutch Republic and abroad, while as a governor of the Dutch East Indian Company he had at his disposal a network that extended over almost the whole known world. Relatives, friends, clients and subordinates in East and West were instructed to collect material. The influential dignitary also received all kinds of artefacts as gifts.²⁷⁰ Vice versa, Witsen generously shared his information and possessions with other citizens of the Republic of Letters such as Cuper and Leibniz. He was also in close contact with the Royal Society, and published occasionally in the *Philosophical* Transactions on ancient Persepolis and the eruption of a volcano on the Moluccan Islands. Witsen's collection was auctioned soon after his death in 1728. Besides coins, he also had Western and non-Western antiquities, ethnographic objects and texts, paintings, portraits, maps and manuscripts from every corner of the world, and an extremely large quantity of naturalia.

²⁶⁸ Peters, 'From the Study of Nicolaes Witsen', 3-4.

²⁶⁹ See Gebhart, Witsen, passim, and Catalogus van de uitmuntende en zeer vermaarde konst- en natuurkabinetten... Zeer keurlyk by een vergadert en naargelaten door den Wel Ed: Heer en Mr. Nicolaas Witsen, including a Catalogus medailles, a Catalogus antiquiteiten en manuscripten, a Catalogus konstwerken and a Catalogus naturalia

²⁷⁰ Nelson, 'Witsen's Letter of 1698 to Martin Lister'; Lunsingh Scheurleer, 'Het Witsenalbum'; Peters, 'Nepotisme, patronage en boekopdrachten'.

Witsen's writings show without a doubt how his unceasing collecting activities served the purpose of charting the whole of God's creation in all its manifold nature.²⁷¹ To understand his intellectual position, it is important to note that he had studied in Leiden under the famous Arabic scholar Golius, which had left him with a boundless fascination with philology. Witsen collected material from all over the world, including the Paternoster written in the most exotic languages.²⁷² He studied Greek, Coptic, Arabic, Turkish, Aramaic and cuneiform, as well as more contemporary languages such as Hottentot, Kalmuk and Samoyed. With Leibniz and Cuper he speculated on the shared roots of the languages that were spoken all over the known world.²⁷³ Like so many intellectuals, Witsen was deeply fascinated by the supposedly symbolic nature of hieroglyphs and Chinese characters; he and Cuper followed the attempts of Maturin Veyssière de la Croze (1661–1739) to decipher them both from Coptic with great interest.²⁷⁴ Witsen collected Egyptian objects and initiated research on Madagascar, where one of the ten lost tribes of Israel was rumoured to have been found.²⁷⁵ Witsen also instructed the preacher Willem Konijn in his challenging quest on Ceylon for similarities between Sinhalese, Hebrew and Greek.²⁷⁶ Konijn was unable to satisfy his 'mecenas and patron' fully. He did send him transcriptions of 'various characters hewn here and there in stone', but was unable to discover any correspondence with Greek, Hebrew and 'Sinhalese roots'.277 Evidently, in line with the traditional fascination of scholars with chronology and etymology, Witsen was searching for remains from the period when there was only one language on earth.²⁷⁸

There are no signs that Witsen tried to regard the Book of Nature and the Bible as two relatively autonomous sources of knowledge. On the contrary, while the connection with the letter of the Bible and the

 $^{^{\}rm 271}$ Cf. Rietbergen, 'Witsen's World'; Peters, 'Two Burgomasters'; Van Berkel, 'Citaten', 181–183.

²⁷² Witsen, *Tartarye*, 7; see Müller, *Leibniz und Witsen*; Drima, 'Materiaux pour servir à l'histoire des langues turques'.

²⁷³ Von der Schuldenburg, *Leibniz als Sprachforscher*, 28; Sebeok, 'The Seventeenth Century Cheremis'.

²⁷⁴ Cuper, Lettres de critique; UBA Ms Be 74 a; UBA Ms Be 61.

²⁷⁵ UBA Ms Bf 85 c; UBA Ms Bf 62b.

²⁷⁶ UBA Ms Bf 60; UBA Ms Be 74a.

²⁷⁷ UBA Ms Bf 90 c.

²⁷⁸ Cf. Bono, Word of God, 3-84; Pombo, Leibniz and the Problem of a Universal Language, 33-52.

interpretation of *naturalia* was gradually loosened under the influence of Swammerdam, Vossius and others, Witsen adhered to the traditional exegesis, the mental framework that Grotius had defended against La Peyrère and De Laet. Witsen shared Vossius' fascination with ancient China, knew his publications, and regularly made use of his extensive library.²⁷⁹ Witsen owned all kinds of objects from China, varying from drawings of flora and fauna to figurines of idols and from a compass to 'a Chinese almanac'.²⁸⁰ Like Vossius, he was virtually obsessed by the traces that the Flood had left in nature and in histories. However, unlike Vossius, Witsen tried to fit the enormous quantity of potentially problematic information and rarities exclusively into the traditional biblical chronology. In fact, all the empirical material was for Witsen a convincing argument for a literal reading of the Pentateuch.

The research that Witsen carried out as a young man on the territory around Amsterdam is indicative of his fixation on the story of the Fall, Flood and Babel.²⁸¹ In his excavations he discovered not only a hollowed tree-trunk that closely resembled the boats of the 'New Netherlands Indians', but also a complete subterranean wood. He related this discovery to the Flood, just as he was later to do with the finding of the remains of 'elephants' (mammoths) in the Russian steppes. As he wrote to Cuper in 1713:

Your honour knows that I own elephant tusks and the skull of an elephant that were found deep below the surface in Siberia, between 65 and 70 degrees in such a cold country that no elephants could live there; they must have been washed up there during the Flood.²⁸²

Witsen regarded the heretical speculations of La Peyrère and Vossius that the Flood described in the Bible was merely a local incident as unworthy of consideration. The Flood played such a crucial role in Witsen's conception of time and space that it can be considered a *Leitmotiv*.²⁸³ Numerous remarks are scattered through his books and letters on remarkable finds in the soil and the diffusion of humans

²⁷⁹ UBA Ms III E 10 fol. 351; Gebhard, *Witsen II*, 373, 377, 395, 431, 442; Molhuysen, *Bronnen IV*, 22*.

²⁸⁰ Catalogus Konstwerken, passim.

²⁸¹ GAA inv.no. 5059, nr. 173.

²⁸² Gebhard, Witsen II, 363–364. See also Witsen, Tartarye, 742–747; Catalogus naturalia, 19–20.

²⁸³ Cuper, *Lettres de critique*, 205; Van der Waals, 'Wankelend Wereldbeeld', 150–151.

and animals over the planet, and Witsen constantly connected these phenomena with one another. For example, in his famous book Aeloude en hedendaegsche scheeps-bouw (Ancient and modern shipbuilding, 1671), he not only presented Noah's Ark as the first boat in world history, but also speculated on how it had been constructed. However, he refrained from tackling the burning issue of whether there had been room on board for the animals of the New World, a problem that was raised increasingly for discussion at the end of the seventeenth century.²⁸⁴ Witsen considered that 'population movements to remote regions and countries' would have been 'impossible' without ships. 285 In numerous places in his published and unpublished works he speculated on how the descendants of Ham, Shem and Japheth had reached America and the recently discovered southern continent, eventually concluding that the story recounted in Genesis was beyond all doubt. The Amerindians were descended via the Tartars from Abraham's bastard son Ishmael who had been driven out (Genesis 21:8), and thus from Shem, Noah and Adam.²⁸⁶ Witsen explicitly sided with Grotius against De Laet in the controversy on the origin of the inhabitants of the New World. The details were different, but the intellectual framework was identical.287

All the same, it would be incorrect to regard Witsen as a dogmatic conservative who was insensitive to the developments in the philosophy of nature of his day. He was receptive to the importance of sensory perceptions, and his collecting activities can be qualified as a comprehensive project to test the match between the empirical world and the textual tradition. The constant interaction between artefact and text is one of the keys to understanding his collection. The results of Witsen's inquiries point in two directions. As the authority of the Book of Books was beyond all discussion for the orthodox collector, numerous findings were placed in a biblical context. On the other hand, Witsen was very critical regarding non-biblical texts and did not hesitate to challenge received opinion. The following examples show how complex this process could be. He concluded from travel reports

²⁸⁴ Allen, Legend of Noah; Rossi, Dark Abyss of Time, 29–40; Cohn, Noah's Flood; Brown, 'The Flood'; Vermij, 'The Flood'; Jorink, 'Noah's Ark Restored (and Wrecked)'.

²⁸⁵ Witsen, Aeloude en hedendaegsche scheeps-bouw, 1-3.

²⁸⁶ Witsen, *Tartarye*, 21, 157–163.

²⁸⁷ Ibid., 159.

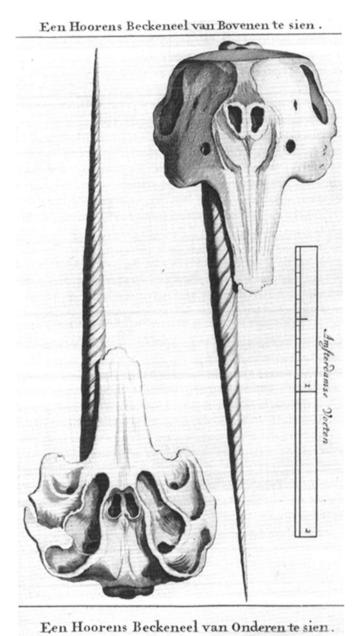


Fig. 56. Nicolaes Witsen was very much aware of the fact that the so-called horn of an unicorn actually was the tusk of a narwhal. He had this specimen fished up in Greenland, and depicted it in his *Noord en Oost Tartarye* (second edition 1705) (KB).

sent to him that the Lamb of Tartary did not grow on trees.²⁸⁸ He was also perfectly aware that the horn of a unicorn was actually the tusk of a narwhal. 'I have one', he wrote to Cuper, 'to which the cranium of the fish is still attached, as I have myself had them fished up in Greenland'. 289 He spared no trouble or expense to obtain an exemplar of this marine unicorn and to have a drawing made of it, since he did not regard the illustrations in Worm and Bartholinus as trustworthy.²⁹⁰ On the other hand, when reports arrived from Siam that unicorns had been seen there and a correspondent sent him a horn, Witsen concluded on the basis of this artefact that the unicorn did exist after all; it was 'a terrestrial animal the size of a goat'. 291 He proudly showed the horn to his friend Cuper, who noted that this must be from the famous wild creature.²⁹² Like his illustrious predecessor Paludanus, Witsen considered that the biblical Behemoth was none other than a hippopotamus; 'a foal of this creature, sent to me from the Cape of Good Hope, is preserved intact in my cabinet'. 293 Witsen also had 'a piece of the cranium of a giant', a relic of the giants mentioned in Genesis 6:4. His cabinet contained other items with a biblical reference too, such as a petrified melon from Mount Carmel, a box 'of holy soil', and a cedar wood crucifix, items that had also occupied an important place in Paludanus' collection.

Witsen's collection of artefacts functioned as the starting point and evidence for his speculations. They were thus characterised by a type of exegesis in the tradition of Voetius, on the one hand, while bearing unmistakable signs of the growing emphasis on the pluriformity and structure of nature, on the other hand. For instance, Witsen had a separate cabinet with a large collection of Surinamese insects.²⁹⁴ When he was sent an unusual creature, he wrote: 'I do not know this fish, it somewhat resembles a crocodile, I have a few dried specimens...so that the wondrous works of God may be seen here'.²⁹⁵ Another incomprehensible creature was the pipa toad. When the first reports from

²⁸⁸ Ibid., 288; KB Ms 72 C 31 fol. 141r/v.

²⁸⁹ Gebhard, Witsen II, 331; Catalogus naturalia, 31.

²⁹⁰ Witsen, *Tartarye*, 903. Cf. Shepard, *Lore of the Unicorn*, 253–273; Ariew, 'Leibniz on the Unicorn'.

²⁹¹ Gebhard, Witsen II, 383.

²⁹² KB Ms 72 C 31, fol. 159.

²⁹³ Witsen, Tartarye, 747.

²⁹⁴ Catalogus naturalia, 31.

²⁹⁵ Gebhard, Witsen II, 415-416.

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Surinam on this creature reached him in 1677, he did all he could to obtain a specimen. When he eventually received one—he was the first collector in Europe to do so—he was so amazed that he sent a sketch with a written description to the Royal Society in 1690, 'and if the Society be desireous to see it in its Colours, I will have it drawn after the Animal itself: Which for my farther Satisfaction was sent over from Suriname'. Sloane wrote years later: 'This was then new to Every body & it was thought a matter of such curiosity by some that the letter & draught were both imbezzled some way or other & never heard of'. The *Philosophical Transactions* thus never came to present Witsen's account, though this was no obstacle to a spectacular rise in the presence of these toads in European collections.

To conclude, Witsen's intellectual framework was strongly influenced by the humanist ideal of knowledge and his collecting activities are strongly reminiscent of those of Paludanus, Heurnius and Ernst Brinck in many respects. The collection that Witsen amassed in the course of four decades clearly shows to what extent the transition from collections of curiosities to cabinets of *naturalia* could sometimes be anything but smooth. The idea that a picture could be formed of the entire creation on the basis of individual entities was still a real option at the beginning of the seventeenth century, but by the end of that century a genuine explosion of information had taken place and Witsen's approach had become a dead end.²⁹⁸ His activities as a collector, on the other hand, pointed forwards as well as backwards. His insatiable urge to collect the most diverse objects was based on an attempt to demonstrate the system that lay behind them. Like his contemporaries Swammerdam and Ruysch, Witsen was receptive to the importance of empirical inquiry and the infinite diversity of the creation. While Swammerdam, Ruysch, Seba and Vincent had a strong tendency not to connect their collections of naturalia directly with the text of the Bible, those *naturalia* functioned for Witsen to illustrate and back up the biblical text. This vision was losing ground in the course of the seventeenth century, but it would still continue to play an important role down to late in the eighteenth century.

²⁹⁶ ARS LBC 11 (1), fol. 184.

²⁹⁷ BL Ms Sloane 4025, fol. 251.

²⁹⁸ Peters, 'Two Burgomasters', 114.

Witsen's fixation on knowledge of nature based on the Old Testament was not atavism, but was to play a prominent role during his lifetime in the influential physico-theological works of Nieuwentijt and Scheuchzer, who repeatedly emphasised that contemporary insights in the natural sciences had already been understood in the Old Testament.299 The theory of the Flood of which Witsen was such a fervent devotee enjoyed renewed popularity at the end of the seventeenth century, partly as a result of the questions that Steno had raised regarding the status of fossils. Johan Jakob Scheuchzer (1672–1733), who published an impressive book on the prediluvian flora in 1709, maintained a very active correspondence with Cuper and was also well aware of Witsen's findings. 300 Given this background, it is not surprising to find two editions of Nieuwentijt's Regt gebruik (The religious philosopher, 1715 and 1725) and an exemplar of Scheuchzer's Herbarium Diluvianum in the auction catalogue of Witsen's library.

Albertus Seba: merchant or minister?

While Ruysch had opened his cabinet to a paying public in 1671, Witsen's collection had more the character of a closed studiolo. The transformation from collection of curiosities to cabinet of naturalia, and from private to public domain, that took place at the end of the seventeenth century can be seen far more clearly in the case of Seba. Born in Etzel in East Friesland in 1665, Albertus Seba established himself as an apothecary in Amsterdam in 1697.301 By operating cleverly in the world of travellers, collectors, apothecaries and physicians, he soon managed to build up an impressive collection. He sold it for a considerable sum to Peter the Great in 1715, after which he started collecting all over again.³⁰² The second collection did not differ in essentials from the first.³⁰³ Seba had good connections with such figures as Merian, Schijnvoet, Rumphius and Boerhaave, took over part of Ruysch's collection, and was on particularly cordial terms with Sir Hans Sloane. 304

 $^{^{299}}$ Vermij, *Nieuwentijt*; Stebbins, *Maxima in minimis*. 300 KB Ms 72 C 31. Cf. Kempe, 'Die Sintfluttheorie von J.J. Scheuchzer'; Sheehan, 'From Philology to Fossils'.

³⁰¹ Engel, 'Life of Albertus Seba'. ³⁰² Driessen, Kunstkamera, 107-116.

³⁰³ Catalogus van de uitnemende Cabinetten...nagelaten door wylen den Heere Albertus Seba; Engel, 'The Sale-catalogue'; Boeseman, 'Vicissitudes and Dispersal'.

MacGregor ed., Sir Hans Sloane; Idem, 'The Natural History Correspondence'.

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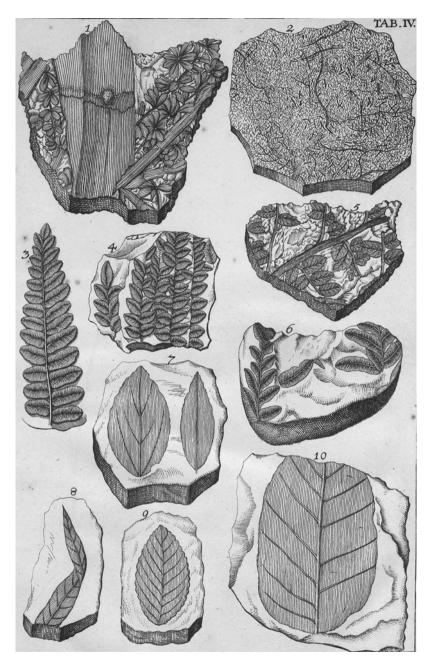


Fig. 57. Some 'lapides figuratis', as depicted in Johann Scheuchzer, *Herbarium diluvianum* (1709). Items like these were interpreted as witnesses of the Flood. This engraving was dedicated to a Dutch collector, Pieter Valckenier (KB).

Seba's collection consisted mainly of naturalia. The sources indicate that they were grouped on the basis of external characteristics: grasses with grasses, snakes with snakes, insects with insects, and so on. Still, we should not take too modern a view of Seba's taxonomy. It was not a strict pre-Linnaean system, but an approach based on association in which the aesthetic dimension played an important role, as it often did at this time. 305 Like Ruysch, Seba also seemed to have applied a liberal admission policy. This was in accordance with the Zeitgeist. For instance, the German scholar Neickel, author of an influential treatise on collecting (1727), had emphasised the importance of the accessibility of cabinets for science and religion.³⁰⁶ Neickel described the cabinet of Seba in which numerous naturalia were displayed, grouped by category, as a good example.³⁰⁷ Seba's intention was not only to open his collection to a broad group of scholars and other interested parties, but also to make it accessible in printed form. He had illustrations made of all his *naturalia* and devoted himself to providing an exhaustive written description.³⁰⁸ The first of the four planned volumes of the Locupletissimi rerum naturalium thesauri (hereafter Thesaurus) was published in 1734. The second volume appeared in 1736, and the others were published posthumously

The foreword to volume I exudes the jaunty mood of eighteenth-century physico-theology: 'Our century outstrips all the preceding ones in that people see with their own eyes and handle the things that people describe with their own hands'.³⁰⁹ The seventeenth century had yielded so many discoveries that 'it is impossible for a single person to describe the whole of nature'. Seba no longer believed in the ideal of such collectors as Aldrovandi, Paludanus and Witsen; God's entire creation could not be encompassed by a single person or at least within a single space.³¹⁰ Seba confined himself to natural history, which was, as he wrote with reference to the works of Ray and Derham (though curiously without mentioning Nieuwentijt), the field that preeminently served 'the greater glory of God's name'.³¹¹ Seba emphasised

³⁰⁵ Van der Roemer, 'Neat Nature'; De Jong, *Nature and Art*, 98–120.

³⁰⁶ Neickelius, Museographia, 418-428.

³⁰⁷ Ibid., 138-140.

³⁰⁸ Holthuis, 'Albertus Seba's *Locupletissimi rerum naturalium thesauri*'; Schmidt, "Imperfect Chaos".

³⁰⁹ Seba, *Thesaurus* I, 'Voorrede'.

³¹⁰ *Ibid*.

³¹¹ *Ibid*.

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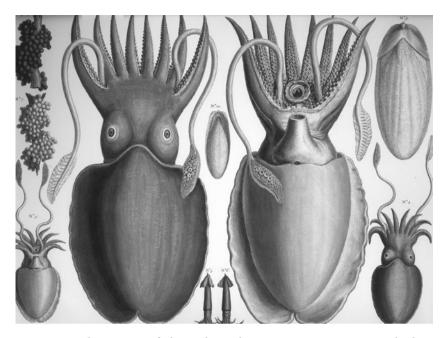


Fig. 58. In the course of the eighteenth century, new taxonomical ideas emerged. This plate, taken from Albertus Seba, *Thesaurus* (1634) shows not only the importance of order and structure, but the role of aesthetics as well (KB).

his pious aims in his correspondence too. 'I would have travelled to London long ago', he wrote in a letter to Sloane in 1723, 'to see the rare wonders of God, but regrettably there are no more enthusiasts there who examine the great wonders of God created through nature'. And when Seba sent Sloane a hand-coloured exemplar of the first volume of his monumental *Thesaurus*, he stressed in the accompanying letter:

As my View in this Undertaking has been to render my best Hommage to the Great Author of Nature, by displaying his curious and wonderfull Works, in the best manner I could, to my Fellow Creatures, so I have not consulted Proffit, nor spared Cost & Pains, to furnish them with abundant Matter for their Wonder and Adoration.³¹³

³¹² BL Ms Sloane 4047, fol. 98.

³¹³ BL Ms Sloane 4054, fol. 13.

Seba's words will no doubt have been read with approval by Sloane, who was the steward of the intellectual heritage of such scholars as Boyle, Ray and Derham, although the question immediately arises of just how sincere they were. With the example of Van Leeuwenhoek in mind, it is difficult to imagine that Seba's enterprise was not also motivated by the desire for fame and other forms of profit. There is little more difficult to interpret than expressions of religious sentiment in historical texts.³¹⁴ We can undoubtedly take the explicit religious statements of such men as Swammerdam and Witsen seriously, because they were pious scholars whose collections did not have a public character, but were primarily intended to serve as the starting point for their own inquiries. The cases of Ruysch and Seba are more complicated, because commercial motives and social conventions played a role for them. However, it is precisely for the latter reason that we should not disregard them as irrelevant. Whether sincere or not, Seba's words illustrate the enormous influence of the eighteenth-century physicotheological discourse. Seba's collection was mentioned as a shining example in Neickel's Museographia and Lesser's books on insect theology. 315 This will certainly have formed a part of the perspective from which visitors to Seba's collection viewed it. An example is Boerhaave, who was delighted to receive a complimentary copy of the *Thesaurus* and thanked the author for the 'completion of the knowledge of God's creatures, by which his being, so worthy of adoration, has furnished our globe'.316

Levinus Vincent: the collection as Wondertoneel

The most accessible and at the same time richest cabinet in the Netherlands at the beginning of the eighteenth century was not that of Seba, but the one belonging to Levinus Vincent.³¹⁷ It could initially be seen in Amsterdam, and later in Haarlem and The Hague. Unlike the other collectors, Vincent had not received any academic or para-medical training; he was a damask merchant by trade. His religious persuasion was also different from theirs, as he was a Mennonite, a religious

³¹⁴ Van de Roemer, 'God en het naturaliënkabinet'.

³¹⁵ Neickel, Museographia, 138-140; Lesser, Ad Albertum Sebam; Idem, Insectotheologia.

Boerhaave to Seba, 2 March 1734, published in: *De Navorscher* 5 (1855) 98. Van Gelder, 'Liefhebbers', 280–282; Van der Veen, 'Klain vertrek', 330.

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Fig. 59. The title page of Levinus Vincent, *Tweede deel van het Wondertooneel der natuur* (1715) illustrates the role of order and aesthetics of collections, as well as their increasingly public character (UBG).

denomination that was very sensitive towards a religious interpretation of nature.³¹⁸ The starting point of Vincent's collection, which he seems to have commenced in the 1690s, was the widely praised collection of his brother-in-law Antonie van Breda, who died in 1693. Vincent was able to expand this collection considerably thanks to a world-wide network and ample financial resources. His contacts included Maria Sybilla Merian and Georg Rumphius, who had also belonged to Witsen's network, and he also had a very important 'chemin secret' at his disposal in Brazil.³¹⁹ Of course, he exchanged much information and many curiosities with his fellow collectors in the Netherlands, and his copious correspondence indicates that he did the same with Sloane and Petiver in England. These sources give the impression that Vincent was a very self-conscious, rather petulant character. He con-

³¹⁸ De Jong, *Nature and Art*, 98–121; Sliggers, 'Honderd jaar natuurkundige amateurs'.

³¹⁹ BL Ms Sloane 4063, fol. 193.

fided in Petiver that 'envy reigns here among several collectors', and Ruysch wrote in a letter to the same correspondent that Vincent was a hot-tempered misanthropist.³²⁰ In spite of remarks of this kind, which could have inevitable repercussions in the polite world of the *curieux*, the damask merchant managed to build up a cabinet of enormous proportions. Visitors at any rate praised Vincent's galanterie, and were full of praise for the wealth, splendour and multi-faceted nature of 'il Gabinetto famoso'. 321 Vincent even had visiting cards printed to further spread the fame of his collection. 322 Like today's museums, he had fixed opening hours and charged admission.³²³ The *musaeum* of the past, to which admittance could only be gained with letters of recommendation and by appointment, had now become a popular, open institution. The book of visitors shows that Vincent's collection was visited not only by princes and scholars, but also by tradesmen, women and children.324 Von Uffenbach, who visited Vincent in 1705, noted that a year would not be enough to view the entire cabinet, and that a book in folio format would be too small to describe it.325

All the same, Vincent undertook a modest attempt in this direction. Starting in 1706, he published a number of works in which his rich possessions were described in word and image. The most important of these are the *Wondertoneel der nature* (Wonderful stage of nature, 1706) and the considerably expanded *Tweede deel of vervolg* (Second volume or sequel, 1715). The high-quality engravings in the first catalogue were the work of the well-known artist Romeyn de Hooghe.³²⁶ These handy works were unlike the gigantic volumes in which Ruysch and Seba had described their collections. At the risk of anachronism, Vincent's role might be described as that of a populariser of science.

The various sources enable us to form a good picture of Vincent's 'Wondertoneel'. Twelve wooden cabinets, each with sliding drawers, lined the walls of a Neo-Classical chamber. As in Seba's collection, each cabinet was devoted to a particular theme or type of animal. Vincent thus had tidily arranged cabinets with birds, quadrupeds, insects,

³²⁰ BL Ms Sloane 4064, fol. 144; BL Ms Sloane 4063, fol. 169.

³²¹ ASF Misc.Med. 92 ins. 1, fol. 99/r.

³²² A card is inserted in BAV Racc.Gen. Scienze III 182 (1).

³²³ Van Gelder, 'Liefhebbers', 282, 285.

³²⁴ Ibid., 281.

³²⁵ Ibid., 280.

³²⁶ On De Hooghe see: Van Nierop e.a., Romeyn de Hooghe.

shells, corals, minerals, and metals. The *naturalia* were arranged sort by sort to form aesthetically pleasing ensembles, for which Vincent's successive wives were responsible. If we consider Vincent's collection in more detail, it is striking how marginal the role of praeternatural, mythical or symbolic artefacts was. They had been replaced by another theme: the multi-faceted variety and beauty of nature.

Typical of the new orientation towards the wonders of nature is the *Description du pipa* that Vincent published in 1726, which not only described his own exemplars of this remarkable creature but also included an illustration of the pipa toad that had been anatomised by Ruysch. God's almightiness was nowhere more clearly manifest than in this viviparous toad, Vincent exclaimed lyrically.³²⁷ Vincent also emphasised the equally wonderful diversity of the Dutch natural world, even though it was usually disregarded. Besides *naturalia* from East and West, he had a sparrow, a duck, a swallow, a raven, a magpie and other items that had not appeared in cabinets in the Netherlands before. This was a remarkable change, which is characteristic of the growing fascination with wonder at the everyday. The wonderful in the commonplace, the large in the small, the unfamiliar in the familiar—these were the key words of eighteenth-century physico-theology.

Vincent's catalogues thus emphasised in the most prolix fashion how his entire collection was intended as a reflection of God's creation. Referring to all of the relevant sources, from *Psalm* 104 to Swammerdam and from Seneca to Ray, he explained that the study of nature could pave the way to true knowledge of God, and that contemplation of the wondrous works in nature could be a form of worship of the divine architect (*omnium Architectus*).³²⁸ Vincent's collection corresponded to the contemporary ideal much more emphatically than Seba's had done. A collection had to be open to the public, it had a didactic function, and served to promote piety.³²⁹ Vincent puts this programmatic principle into practice. He explicitly stated that the establishment and display of a cabinet should be regarded as a pious deed:

Come, forsaker of God, who contemplate these wonders, You who remain in the dark like an owl,

³²⁷ Vincent, Descriptio pipae, a2/r.

³²⁸ Vincent, Elenchus, 'Praefatio', *2/v.

³²⁹ Van Gelder, 'Liefhebbers', 284.

Come into the light and learn, from each and all of these works, To perceive the supreme artist in his doings.³³⁰

The increasing accessibility of the collections was part of a much broader strategy to draw the attention of atheists to God's providence in even the most insignificant creature: those who did not want to believe must take a look for themselves in a cabinet or in living nature. It is therefore no surprise that Vincent's cabinet was presented as a shining example in many physico-theological works of the eighteenth century.³³¹ The tranquil and closed world of the humanist *musaeum* with its classical texts and *mirabilia* had been transformed into a 'wonder stage of nature' that was accessible to all.

5. Concluding remarks

Prominent collectors in the Netherlands such as Witsen, Seba and Vincent owed the presence of *naturalia* from the East in large measure to Georg Everard Rumphius (1682–1702), the famous blind 'Pliny of Ambon'. This employee of the Dutch East Indian Company post-humously published *Amboinsche rariteitkamer* (Ambonese curiosity cabinet, 1705) contained not only a wealth of information about *naturalia* in the East Indies but also, almost in passing, a sketch of the culture of collecting in the Netherlands. For example, besides presenting descriptions and images of countless previously unknown types of shells, Rumphius also stated which collectors in the Netherlands had them in their possession.³³²

The transformation from collection of curiosities to cabinet of *naturalia* can be illustrated by Rumphius' description of a remarkable shell, the 'Polish Hammer, also known as the Indian Kris because of its shape'. He stated that the shell was previously known as the 'Cross Doublet', 'which represented an upright cross on which the appearance of a body appeared'. This shell was regarded as a wonder in the past and collectors were prepared to pay a hundred ducats for it; 'but its strangeness has now disappeared, now that it is known that it is a genus'. Wonder was no longer provoked by the praeternatural status,

³³⁰ Vincent, Wondertooneel, 20.

³³¹ See for example Lesser, Ad Albertum Sebam, 73–75, 88.

³³² Rumphius, *D'Amboinsche rariteitkamer*, 160. On Rumphius see: Beekman, *Troubled Pleasures*, 80–118.

scriptural connotations and symbolism of the objects in the collection, but by the order, structure and underlying regularity of the whole of creation. The collection that Paludanus assembled between 1583 and 1630 was a very complex whole that was open to various interpretations; the curiosities it contained can be regarded as signs that point in all directions. Paludanus' musaeum was the product of the humanist heritage, the intellectual world of Aldrovandi, Camerarius and Scaliger, in which the striving for universal knowledge played a key role. Philology, natural history and collecting formed an indissoluble whole. We can find clear traces of different, interconnected ideas in the collections of Paludanus and of Leiden University. Antiquities from ancient Egypt, miraculous, praeternatural, natural and symbolic objects—they all referred to God, as did the many silent witnesses of events in biblical history. Chronology, geography, texts and objects formed a continuum. Words and things were intertwined: the collection had a narrative character that called for exegesis.

In the collections of Seba and Vincent of a century later, the complexity is considerably reduced. Wonder, the *conditio sine qua* non for collecting, was now primarily evoked by the multi-faceted nature, the astounding anatomy and structure, and the infinite purposiveness and beauty of visible nature that was in principle visible to all. The theme of God as the almighty architect, which had played a role since antiquity and was used by Paludanus in the context of his shell collection, received by far the most emphasis here. A sharp distinction was drawn between past and present. Exegesis gave way to description, the search for symbolic meanings was replaced by an empirical attitude. The collections of *naturalia* now only pointed in two directions: towards the kinds and genera to be found in nature, and to the almighty architect who had created them.

Two more or less parallel developments lay behind this striking shift in emphasis. The first is the emergence of textual criticism. It is important to emphasise that at first collecting was to a large extent a humanist activity, one of whose aims was to illustrate the *sapientia veterum* on the basis of separate entities. However, due to the influx of inscriptions and objects that had been unknown to antiquity and of information about the history of non-Christian peoples, the traditional interpretation of the canon in general, and the biblical story of the Flood and Babel in particular, was increasingly called into question. It was partly the material from East and West provided by col-

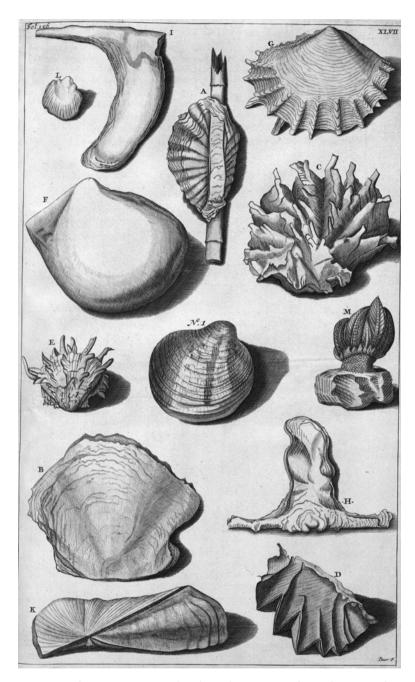


Fig. 60. Page from Georg Rumphius' posthumous Amboinsche rariteitkamer (1705); to the lower right (figure H) the 'Polish Hammer'. (KB).

lectors like De Laet and Worm that gave La Peyrère and Isaac Vossius ammunition to attack traditional conceptions of the genesis and diffusion of peoples, languages, flora and fauna. Developments in textual criticism increased the distance between text and object, between past and present. Collections no longer unequivocally narrated the story of Moses, Herodotus, Aristotle, Pliny and the Physiologus. The growth of empirical material (anteater, sloths, pipae toads, the tusks of narwhals, birds of paradise with feet) brought on a crisis of the intertextual, emblematic view of the world. The same is true of the influx of information about non-Christian languages and chronologies. The collection of curiosities, originally partly intended to bring the classical and Christian corpus to life, had—paradoxically—sown the seeds of scepticism and doubt.

While philological development in the first half of the seventeenth century led to a cautious unravelling of the complicated textual web, the step toward searching for order and structure was largely due to a second factor: natural philosophy. Swammerdam introduced an epistemological programme according to which the textual tradition was fairly irrelevant and only the external forms and underlying regularities mattered. The difference between beautiful or ugly, rare or common, praeternatural or natural, no longer counted, neither did the knowledge enshrined in books, marginal comments and commentaries. Only the structure of the whole creation that could be directly perceived by the senses was proof of divine providence. Although it is difficult to determine the precise influence of Swammerdam, a similar character increasingly came to dominate in cabinets in the Netherlands in the last quarter of the seventeenth century.

It is no coincidence that this shift was accompanied by a change in the presentation of collections. Collections like those of Paludanus and other Dutch scholars such as Brinck and Colvius had a largely closed character: they were virtually sacred treasure chambers of erudition, which were usually only accessible to other scholars. Piety was the starting point and purpose of Swammerdam's collection too, but he made these ideas explicit in his attacks on atheists: anyone who did not believe in God's creative almightiness must take a look in the cabinet, or, even better, in the Bible of Nature, to be convinced by what his own eyes saw. It was partly thanks to Swammerdam that a discourse emerged at the end of the seventeenth century in which the key words were access and observation. The collector should not hoard his col-

lection like a treasure, but show it to other people to the greater glory of God. The pluriformity of shells, stones, plants and animals was now proof of the existence of a providential God, who had created all of his works with wisdom. Nature was still seen as a Book of God, but in the study of that book the emphasis shifted from the deeper meaning of the book to its structure, syntax and grammar. The collector was no longer a literary figure, but had become more like a philologist.



Fig. 61. In the Dutch Republic, many popular works were devoted to the 'wonders of nature', as for example this anonymous and rather clumsy work, Wonderen der natuur (1694) (KB).

BOOKS OF WONDERS: FROM RARITY TO REGULARITY

1. Introduction

At the age of twenty-two, the student Johannes de Mey visited the collection of curiosities of Paludanus in Enkhuizen in 1639. Paludanus himself died in 1633, but the collection was still accessible for years until his heirs sold it to Duke Frederik III of Schleswig in 1651. De Mey was deeply impressed. He was to remain fascinated by shells, the magical powers of stones, remoras, meteorites, miraculous trees, and countless other marvels throughout his life. Wonder at the works of God is the main theme in the sizeable oeuvre of the preacher. This emerges very clearly from the book that De Mey published in 1666, *Halelu-jah*, of lof de Heeren verbreydt op het natuer-toneel (Hallelujah, or praise the Lord, demonstrated on the stage of nature). This work dealt extensively and critically with all the marvels of the divine creation, varying from biblical animals to the flora and fauna of America, and from malformations at birth to the craters on the moon. The explicit purpose was to arouse wonder (admiratio).

This was not an isolated work, but proves upon closer inspection to be an exponent of a particular genre. Long before the publication of Nieuwentijt's *Regt gebruik* (1715), panoramic surveys based on the Bible and contemporary observations had appeared that set out to explain that the works of God were wondrous, that they could confirm Christians in their faith, and that they could convince atheists that there was a providential creator. This can be regarded as a separate genre in the broad range of early modern publications on nature, varying from commentaries on *Genesis* to alchemical treatises, and from astronomical speculations to apologetic writings.

¹ Van Gelder, 'Liefhebbers', 263-266.

² De Mey, Al de Nederduitsche wercken, 777.

³ De Mey, *Halelu-jah*, of lof des Heeren, verbreydt op het natuer-toneel. This work was later included in: De Mey, *Al de Nederduitsche wercken*, 410–522.

⁴ De Mey, Al de Nederduitsche wercken, 413.

In terms of both form and content, the work of De Mey and likeminded authors evokes associations with works that were published in other parts of Europe, such as Jean Bodin's *Universae naturae theatrum* (1596). Ann Blair has written that this book:

brings to light a kind of natural philosophy which is not often taken seriously in the history of science—works designed to instruct and delight nonspecialists, from university students and other 'studious persons' to more general readers, for example, those identified as the 'curious'. This more 'ordinary' natural philosophy, not noted for avant-garde contributions to special fields, has frequently been ignored as mere compilation or vulgarisation.⁵

She emphasises that Bodin's work was no isolated phenomenon, but should be seen as a manifestation of the very lively interest, partly motivated by religious considerations, in the wonders of nature at the end of the sixteenth century. Thus the French wars of religion formed the background to Bodin's emphatic claim that contemplation of nature can bring people closer to God than study and discussion of the Bible.⁶ 'Nature can accomplish, Bodin claims, what divine revelation and injunctions cannot'.⁷ By presenting nature as a book, theatre or cabinet of God, and successively discussing the wonders that occur in it, Christians were confirmed in their faith, and atheists and others who denied God would also come to their senses, Bodin claimed.

Works like those of Bodin and De Mey can be characterised as a separate genre in the early modern period. Renaissance literature is not particularly known for a strict separation of genres, but it may be useful for historians today to distinguish between different currents in terms of ideal types.⁸ The category of works that will be discussed in this chapter are known as *livres de merveilles* or *histoires prodigieuses* in France and as *Wunderliteratur* in Germany.⁹ The term adopted here, books of wonders, indicates both that these works are concerned with the wonders of nature, and that they are intended to provoke a sense of wonder on the part of the reader.

⁵ Blair, Theatre of Nature, 14.

⁶ Ibid., 14, 22.

⁷ Ibid., 22.

⁸ Cf. Imbrie, 'Defining Nonfiction Genres'; Blair, Theatre of Nature, 15.

⁹ Céard, 'Introduction' in: Paré, *Traité des monstres*, xxvii; Idem, *La nature et les prodiges*, 252–335; Schenda, *Die französische Prodigienliteratur*, 5.

These Dutch books of wonders have four main characteristics. First, the works have an explicitly pious, often apologetic purpose, in which the creation is presented as a book, theatre or mirror. Second, the works are based on a wide range of sources, varying from the Bible to personal observations. Third, the works offer a survey of the most 'wondrous' facets of the whole of nature. They go beyond the level of specialised subjects such as insects or the flora and fauna of Brazil, to present the creation as a continuum. Fourth, the works appeared in the vernacular because the authors were primarily aiming at a wide audience. Natural philosophical profundity or originality are rare. The authors were not first-rate researchers, but usually ministers and curieux.

This chapter provides a provisional inventory and analysis of the books of wonders that were published in the Dutch Republic between about 1590 and 1715. Although all of the works seem to address a broad public, the question of the reception of these books will not be dealt with here, where the focus is on the contents of these works. Books of wonders, as we shall see, were primarily books about the Book of Nature. Their content and purport show a striking correspondence with such phenomena as cabinets of curiosities.

Classical and Christian heritage

Reflections on the wonders of nature traditionally oscillated between two poles. The Old Testament already called for attention to the unmistakable order and purpose of the creation. God planted cedars in Lebanon, the Psalmist sang, 'where the birds make their nests', and he had also 'appointed the moon for seasons' (*Psalm* 104:16–19). 'Hast thou entered into the treasures of the snow, or hast thou seen the treasures of the hail?', God asked Job in a verse (*Job* 38:22) that was very popular in the eighteenth century.¹⁰ On the other hand, the Bible showed that the hand of God was manifested in striking ways: not only miracles such as the battle during which the sun and moon stood still (*Joshua* 10:12–13), but also in accounts of all kinds of animals and plants. Wonder at the unicorn, Behemoth and Leviathan has already been mentioned in the previous chapters. From antiquity until late in the early modern period, scholars were fascinated by the

¹⁰ Job 38:22. Cf. Bots, Tussen Descartes en Darwin, 64-67.

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diamond, 'an adamant harder than flint' (Ezekiel 3:9), or the basilisk ('for out of the serpent's root shall come forth a cockatrice, and his fruit shall be a fiery flying serpent', Isaiah 14:29). True to the biblical precedents, Augustine also evoked wonder at God's creative almightiness. Chapter XXI of his De civitate Dei, in which he claimed that the natural course of things, remarkable natural phenomena, and miracles were all solely attributable to God's almightiness and goodness, proved to be particularly influential. That is why Augustine paid attention not only to the sun, the course of the stars and planets, the succession of the seasons and all life on earth (in the spirit of Psalm 104), but also to more unusual phenomena. He claimed to have seen the enormous teeth 'of some giant' with his own eyes. 11 He also paid considerable attention to salamanders who are able to endure fire, to phosphorus, magical stones, magnets, the incorruptibility of the flesh of peacocks, and other matters which appear to be in contradiction to the order of nature. 12 However, they are the result, not of hidden forces or the work of the devil, but of the almightiness of God.

Therefore, just as it was possible for God to make such natural kinds as He wished, so it is possible for him to change those natural kinds into whatever he wishes. From this power comes the wild profusion of those marvels which are called omens, signs, portents, prodigies. If I should try to recall and enumerate these, where would this treatise end?¹³

This did not stop Augustine from going at length into the nature of bizarre human beings, hermaphrodites and monstrous humans malformed at birth. Augustine believed that the origin of all natural and exceptional natural phenomena lay in the will of God: All marvels are surpassed by His marvellous power. The purpose of the divine creation was not to find natural explanations, but to stimulate pious contemplation.

A source that Augustine had studied profoundly was Pliny's *Naturalis historia*; the bishop of Hippo called Pliny a 'man of great learning'. ¹⁶ Pliny's work presents in principle the same broad spectrum of marvel-

¹¹ Augustine, City of God XV, ix.

¹² *Ibid*. XXI, v-viii.

¹³ Ibid. XXI, viii.

¹⁴ Ibid. XVI, viii.

¹⁵ Ibid. XXI, vi.

¹⁶ Ibid. XV, ix.



Fig. 62. The *Prodigiorum liber* by Julius Obsequens (ca. 300) was extremely influential in early modern Europe. These are two pages, including hand coloured engravings, are taken from the 1589 edition, published by Jean de Tournes in Lyon (UBG).

lous things as the Christian works: everything from the orderly course of the planets to the miraculous powers of minerals. Pliny claimed to describe no less than twenty thousand marvels. Here too the boundary between what is natural, prodigious and miraculous was a fluid one. Pliny did not make any clear pronouncement on the existence of a god. Sometimes *Natura* seems to be identical to *Deus*, sometimes a certain distance is created between a creative force (*Deus*, *Architectus*) and the *natura rerum*. In essence, everything in nature was a *miraculum*. From a Christian perspective, Pliny's view of the wonders of nature was to a large extent consistent with the Christian conceptions of the creation, and he also provided a wealth of 'facts' and references.

The same was true of another classical work, Cicero's *De natura deorum*. The Christian tradition tended to identify the Stoic spokesman Balbus with the author himself, and his discourse on *providentia* in nature consequently bore the authority of Cicero. In the monologue,

Balbus places great emphasis on the order of nature: the harmony in the cosmos, the functionality of the human body, the care of animals for their young, the marvellous migration of cranes.¹⁷

There was a negative side to the purposiveness and beauty of nature. That grimmer side of providence was presented in the work entitled Prodigiorum liber, which was written around 300 AD by Julius Obsequens. Largely following Livy, the author provided a chronological survey of all ostenta and signa since the foundation of the city of Rome that had been warnings that the link with the higher powers had been disturbed.¹⁸ The work was soon incorporated into the Christian tradition since it was in accordance with views about divine warnings. Besides, it provided a useful series of references for scholars in the sixteenth and seventeenth centuries who wanted to support their claims with arguments based on authority. Slowly but surely, however, this work succumbed to the growing historical awareness of the early modern period. In 1720 the Dutch philologist Franciscus Oudendorpius (1696-1761) definitively laid it to rest in the cemetery of text editions, adding that this source could help the reader to form a picture of the superstitious mores of the ancient world.19

Sixteenth-century works

As a result of a complex of factors, there was a very lively interest in the wonders of nature in the sixteenth century. Wars of religion, voyages of discovery, developments in the philosophy of nature, and a new appreciation of the classical heritage were of great importance in this connection. If we confine ourselves to the development in Protestant Europe, it is noteworthy that here too attention for the wonders of nature was defined by the two parameters 'natural' and 'praeternatural'. That the order of nature was in essence a single continuous wonder was the message of Melanchthon, Calvin and others, who referred to the Bible, Augustine and Seneca. But in these turbulent times it was the more unusual features of nature, the praeternatural events, that drew attention to God's almightiness. That scholarly obsession with *mirabilia* is admirably illustrated by the fact that Obsequens' *Prodigiorum liber* went through no less than seventeen impressions between

¹⁷ Cicero, De natura deorum II, 132.

¹⁸ Lebrecht Schmidt, Iulius Obsequens und das Problem der Livius-Epitome.

¹⁹ Schenda, 'Prodigiensammlungen', 640–641; Céard, La nature et les prodiges, 161–192.

1508 and 1555.20 In the light of the Reformation, praeternatural phenomena seemed to be signs of God's approval or disapproval, possibly heralding the end of the world. In 1534 Luther and Melanchthon published an illustrated pamphlet, Deuttung der czwo grewlichen Figuren, Bapstesels czu Rom und Munchkalbs zu Freijberg, in which the appearance of two contemporary monsters was taken to be a divine indication of the bestial character of Papism. The work published in 1532 by Joachim Camerarius I, De ostentis libri duo, for which Melanchthon wrote the foreword, was more academic in tone.²¹ But by far the best-known exponent of the genre was Lycosthenes' Prodigiorum ac ostentorum chronicon, first published in 1557. This formidable work not only provided an exhaustive survey of all of the prodigia that had ever been recorded, but was also deeply religious in tone. The signs that God had sent to arrogant humanity were manifold. Lycosthenes started with the serpent in the Garden of Eden, and ended with a very comprehensive summary of signa that had appeared between 1550 and the year of publication. The work was a real treasure trove of scholarly allusions, and was later often consulted, if not plundered, by scholars who wanted to add force to their arguments on prodigia.²² What also made the book so attractive was the large number of appealing woodcuts. The books of prodigies that followed in the wake of Lycosthenes, often compiled by German humanists, likewise offered chronological surveys of all the appearances of comets, children malformed at birth, showers of blood and earthquakes down to their own time.²³ Clearly these scholarly compendia must have had a major influence on the conception of natural wonders at the time.

The genre received a new impulse from France in 1560, when the first edition of the *Histoires prodigieuses* was published in Lyon. The author was Pierre Boaistuau (ca. 1520–ca. 1566). His work was both innovative and successful. Its starting point was the books of prodigies by German authors, but they were usually written in Latin and were marked in large, and thus expensive, formats. Boaistuau's richly illustrated book appeared in the vernacular and in the convenient duodecimo format. It was innovative in other ways too: it was not arranged

²⁰ Schenda, 'Prodigiensammlungen', 640-641.

²¹ Camerarius, De ostentis libri duo, cum praefatione Phil. Melan.

²² See for example: Mulerius, Hemelsche Trompet; Voetius, Exercitatio, 49–52.

²³ For an extensive survey see: Schenda, 'Prodigiensammlungen', 699–710. See also: Schilling, 'Fincel'; Céard, *La nature et les prodiges*, 174–191; Ewinckel, *De monstris*; Daston and Park, *Wonders and the Order of Nature*, 175, 182–187.

chronologically, but presented a summary of all kinds of *mirabilia* and *prodigia* in an apparently arbitrary order. That made it more readable and digestible; moreover, it could be expanded infinitely with new lemmata. That was exactly what happened: the book was endlessly reprinted and revised.²⁴ It was also translated into a number of languages, including Dutch.

Boaistuau took his task as a compiler seriously. Little is known about him, but the picture emerges of a deeply religious man.²⁵ He was apparently fascinated by the wonders of nature from an early age and travelled all over Europe to view all kinds of strange things and rarities with his own eyes. He studied medicine and law, after which he entered the employ of various patrons as a secretary, and went on to publish numerous historical and moralising works. It is significant that he also worked on an (unpublished) translation of Augustine's De civitate Dei. 26 Boaistuau's indebtedness to the bishop of Hippo is patently clear in the Histoires prodigieuses. He also took much of his material from the German books of prodigies. The Histoires were studded with many observations of his own, and Boaistuau drew widely on the most recent writings on natural history and natural philosophy, including Gessner and Cardanus. The explicit purpose was to give a picture of 'certain rare, strange and marvellous things'. As in Augustine, he uses the word 'prodigious' in the sense of 'striking' or 'marvellous'. 'Marvels' are not just signs of God's wrath, but manifestations of his almightiness.

Both the form and content of Boaistuau's work display a striking parallel with the cabinets of curiosities of his time. It is thus hardly fortuitous that the author noted on his former patron Jehan de Rieux that he was 'very curious to recover several ancient and strange things, with which he filled his cabinet, which bring a marvellous contentment to those who contemplate them'.²⁷ Just as sixteenth-century visitors to a cabinet of curiosities could gaze in awe at medicinal herbs, anthropomorphic fruits, magical stones, marine monsters, snakes, remoras, birds of paradise, numerous creatures malformed at birth, corals and

²⁴ Chotzen, 'De *Histoires prodigieuses* van Boaistuau'; Schenda, *Französische Prodigienliteratur*, 34–35.

²⁵ The most complete biographical account in: Boaistuau, *Histoires tragiques*. Ed. Carr ix-lxxxvii

²⁶ Schenda, Franzözische Prodigienliteratur, 29.

²⁷ Boaistuau, *Histoires prodigieuses*. Ed. Mathieu-Catellani, 100–101.

other rarities, so Boaistuau's readers were treated to descriptions and illustrations of exactly the same things. The author added that these marvels demonstrated the almightiness of God. While the objects were supposed to speak for themselves in the cabinets, Boaistuau provided them with explanatory comments. Thus he expatiated on the occult forces of magnets and described the experiments he had conducted to show that diamonds were endowed with miraculous powers. His kaleidoscopic survey did not fail to include descriptions of the appearances of comets, heavenly bodies and spirits, as well as informing the reader about how Pliny fell into a volcano. In the eyes of Boaistuau, the whole of nature was one big treasure house of wonders.

2. Books of Wonders in the Dutch Republic down to around 1660

Wonder at nature was also reflected in many books in the Low Countries. For instance, the *Occulta naturae miracula* (1559; many reprints) by the physician from Zeeland Levinus Lemnius (1505–1568) was famous throughout Europe.²⁸ Written in a turgid Latin (no Dutch translation is known), this work by the Catholic Lemnius explained a theme that was later to appeal strongly to Reformist circles: everything in God's creation, both the regular and the irregular, is a source of wonder.²⁹

The reflections of Protestant scholars moved between the same two poles of rarity and regularity. In the specifically Dutch genre of the georgic known as the *hofdicht*, the emphasis was naturally on the order and inherent structure of all that had been created, often with a reference to the Book of Nature. For instance, the poet Philibert van Borsselen (ca. 1575–1627) wrote about the Den Binckhorst country estate in 1613:

Where every fertile tree, beautiful flower, and healing herb Points to the Lord's power, wisdom and strength: Where every piece of work can be a silent master To fruitfully and joyfully teach the knowledge of God.³⁰

Van Hoorn, Levinus Lemnius; Thorndike, History VI, 306; 393–394; Eamon, Science and the Secrets of Nature, 274–275; Crowther, 'Sacred Philosophy, Secular Theology'.
 Lemnius, Occulta naturae miracula I, 37–39; 80; 89.

³⁰ Van Borsselen, *Den Binckhorst*, here quoted after: Muller, *De dichtwerken van Philibert van Borsselen: een bijdrage tot de studie van zijn taal en stijl*, 101. See also: De Vries, *Wandeling en verhandeling*, 43–72.

Against the background of the publication and popularity of writings of this kind, it is remarkable that not a single Dutch-language book of wonders was conceived in the Dutch Republic until around 1640. We can only guess at the reasons for this. It cannot have been due to any lack of interest in the wonders of nature. It is not unlikely that the growing volume of reports of voyages of discovery, for example, met this demand.³¹ It is even more likely, however, that it was due to the popularity of Dutch editions of Boaistuau's *Histoires prodigieuses*.

Boaistuau's Wonderlijcke Schadt-boeck and Dutch followers

The first Dutch translation of Boaistuau's book of prodigies appeared in 1592, and subsequent editions were published in 1596, 1608 (twice), 1648 and 1670, which is an indication of the popularity of the work.³² The title of the translation, Het Wonderlijcke Schadt-boeck, literally means The Wondrous Book of Treasures. The publisher opted for a small format and many illustrations. Later editions remained close to the original and differed only on points of detail. Something of the ominous nature of the title Histoires prodigieuses was lost, but the Dutch title was in fact a closer fit to the contents. Dutch readers were informed that the work was based on a thorough reading of 'certain authors, to inquire there, and to find some strange and marvellous pieces'.33 So the Dutch readers were regaled with descriptions of all kinds of rarities such as barnacle geese, spirits and celestial phenomena, 'unnatural births and creatures', a flying fish, lycanthropes, anthropomorphic stones, and the remora. Besides Pliny, contemporary mariners wrote about this fish, who claimed to have seen the prodigious strength of the creature with their own eyes.34

Boaistuau's books of wonders were a part of the same fascination with the wonders of nature that led Dutch enthusiasts to create collections of curiosities. Books of wonders and cabinets of curiosities are two sides of the same coin. In these two media, text, illustrations and tangible objects presented the same *mirabilia*, the same letters from the Book of Nature. The corpus of biblical and secular texts generated not only constantly expanding collections, but also new texts, which

³¹ Van Linschoten, *Itinerario*. Ed. Kern and Hunger, lxxxviii.

³² Chotzen, 'De Histoires prodigieuses van Boaistuau'.

³³ Boaistuau, Wonderlijcke Schadt-boeck, 'Aen den leser'.

³⁴ *Ibid.*, 32 [=42].

in turn provided new collecting impulses. The result was a metatextual canon that was very influential in structuring the perceptions of the wonders of nature. When it appeared in the 1560s, Boaistuau's work was undoubtedly one of the most accessible writings on natural wonders. Biblical and above all classical literature were scrutinised in terms of the most recent works by such writers as Gessner, Rondelet and Cardanus. However, as a result of the continuous process of reading, collecting, investigating, describing and illustrating, within a few decades scientific questions were raised about many of the prodigious events that Boaistuau presented as fact. While he was able to demonstrate the almightiness of God on the basis of the birds of paradise that were supposed to spend their whole lives in the air because of the lack of feet, by 1640 the average collector in the Dutch Republic knew better. Still, the literary and artistic tradition was very powerful. We know that, in spite of the growing volume of new, often contradictory empirical data, the textual and graphic representation of all kinds of naturalia hardly underwent any change in the course of the seventeenth century, as can be illustrated by such well-documented examples as the rhinoceros, the unicorn, the sloth and numerous insects.³⁵ The development of the books of wonders in the course of the seventeenth century follows a similar pattern.

Boaistuau's Wonderlijck Schadt-boeck was reprinted without any changes in the Dutch Republic down to 1648. It may be assumed that the constantly alert publishers in Holland saw little point in going on with the work after this date (the 1670 edition was published in the Southern Netherlands). It would appear that by this time the book had gone out of fashion outside the scholarly world too, in the broad circle of curieux. However, the role of the work was not yet exhausted. On the contrary, it proved to be a successful model. The kaleidoscopic material offered full scope for changes, additions and elaborations on the basis of material provided by the expanding influx of artefacts from East and West, and the many new travel accounts and natural histories.

A good illustration is provided by the work that the Amsterdam printer Jan van Duisburg (1632–1702) published in 1657: *Toonneel der gedenkwaardigste wonderen, geschiedenissen en vreemdigheeden* (Stage of the most memorable wonders, histories and strange events),

³⁵ Ashworth, 'Persistent Beast'.

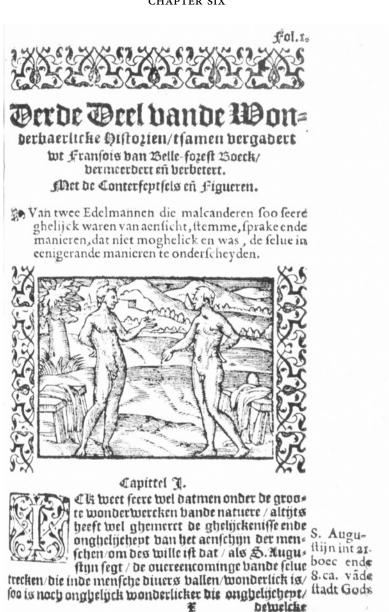


Fig. 63. Page from the first Dutch translation of Boaistuau's *Histoires prodigieuses* (1592): the marvellous story of two virtually identical men. The source of this entry is Augustine, *City of God* (KB).

with the significant subtitle Uyt de Heer Bosteau en anderen dus in beknopt Duyts gestelt (Excerpts from Mr Bosteau and others, written in Dutch).³⁶ There is certainly nothing deep about the work of this compiler. The work drew heavily on the Dutch translation of Boaistuau, except that Van Duisburg sometimes included excerpts from more recent literature as well. The reader was regaled with magical stones, burning mountains, wondrous and terrible ways of dying, freaks, serpents, anthropomorphic naturalia, and earthquakes. With explicit reference to Augustine, the message was repeatedly driven home that such praeternatural phenomena also had a supernatural meaning. In one of the few passages in which the author refers to contemporary events, he relates how he has seen an elephant in Amsterdam that could do all kinds of tricks, such as fencing, firing a pistol and spouting water. This must have been a performance by the famous elephant Hansken, which toured the Dutch Republic in 1642.37 One of its most striking achievements was to catch a pickpocket in the act. 'So God teaches us in nature', Van Duisburg piously noted, 'the rule of our life, to punish evil, to give justice its place, to honour and to thank him, through the examples of beasts without reason'.38

A number of similar works were published around the same time by the Groningen poet and *curieux* Johan van Nijenborgh (1621–ca. 1670). *Het Nederlandse lust-hofken* (The Dutch pleasure garden) appeared in 1647, followed ten years later by an extended version entitled *Het Wonder-toneel ofte lusthof der historie-paerlen* (The stage of wonders or pleasure garden of pearls of history).³⁹ Van Nijenborgh wrote a number of moralising works on local history and on how to bring up young people. The highly readable and richly illustrated works appear to have enjoyed great popularity. The author dedicated his books to the well-to-do citizens of the provinces of Groningen and Holland, including Pieter de la Court. Local dignitaries wrote poems to accompany his books. His work demonstrates, almost in passing, how the passion for the wonders of nature was shared by important sectors of the provincial citizen body.

³⁶ Van Duisburg, Toonneel der gedenkwaardigste wonderen... Uyt de Heer Bosteau en anderen dus in beknopt Duyts gestelt. On Van Duisburg: Van Eeghen, De Amsterdamse boekhandel 1680–1725 IV, 207–208.

³⁷ Cf. Bakker, 'Rembrandt en de olifant', 28.

³⁸ Van Duisburg, *Toonneel*, 293.

³⁹ Het Nederlandsche lust-hofken; Idem, Het wonder-toneel ofte lusthof der historipaerlen.

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Van Nijenborgh's books on the wonders of nature consist to a large extent of borrowings. Emblems, illustrations, biblical quotations, personal observations and moralising rhymes form an astonishing collage. 'The world is a book of wonders', was Van Nijenborgh's credo. 40 His debt to Boaistuau is particularly evident in the two works mentioned above. They were both published in duodecimo format and well illustrated. Descriptions of the familiar praeternatural matters alternate with striking naturalia, emblematic animals and wondrous events. In other words: we find the familiar mixture of freaks, comets, anthropomorphic stones, remoras, chameleons and birds of paradise. However, the works also included more recently discovered wonders, usually from the East and the West. For instance, referring to Van Linschoten, the compiler described the tree 'Magucij'. This was believed to supply the local population with water, wine, vinegar, wood, thread, needles and other domestic attributes. Like his main model, the wellknown poet Jacob Cats, Van Nijenborgh regarded the creation as an inexhaustible source of religious symbols and moral lessons. Nature is a book of wonders in which humankind can view the almightiness of God: 'For God the Lord is almighty and wonderful in all his works.'

Not only merchants but also ministers preached this message. In 1663 the Schoonhoven minister Joshua Sanderus (ca. 1591-ca. 1664) published 's Weerelds wonderen sichtbaar in bysonder toevallen der natuur (The wonders of the world visible in unusual coincidences in nature). This representative of the Further Reformation had already made a name for himself as the translator of Pietist writings. 41 This work is based on the 'leading writers', among whom the 'signieur de Launay', i.e. Boaistuau, is prominent. Here too we see the familiar parade of *mirabilia*. In addition the reader is treated to descriptions that are not found in other works on 'the uncommon and marvellous love and similarity of a lynx and a crane to humans, as can also be seen in trees', and two short chapters on the wonderful world of insects, entirely based on the traditional emblematic sources.⁴² As in earlier Dutch books of wonders, little heed is paid to recent publications. What is striking is the great attention that the minister pays to more worldly affairs such as the vicissitudes of princes and bloody murders.

⁴⁰ Van Nijenborch, Het wonder-toneel ofte lusthof der histori-paerlen, 165.

⁴¹ Heijting, 'De Dordtse uitgever François Boels', 125–126.

⁴² Sanderus, 's Werelds wonderen, 4.



Fig. 64. The frontispiece of Van Nijenborgh, *Nederlandsche lust-hofken* (1647) reveals the content of the book: stories of monsters, lions, and the *arbor triste*. On top Adam and Eve in the Garden of Eden before the Fall (KB).

That tendency was continued in the *Wonderen des werelds* (Wonders of the world) by the prolific Petrus de Lange, which was published in 1671. This work, published in quarto format without any illustrations, is a *pot-pourri* of noteworthy items, and here too accounts of remarkable historical events alternate with curiosities from living and dead nature. We come across brief descriptions of an unnatural source of fresh water, Jews 'of very small stature', the extraordinary fight of a blind man, an uncommonly large tortoise, a horned fish, a rare light phenomenon and 438 other such items. The form of this book was clearly borrowed from Boaistuau, though he is almost never cited. De

Lange made use of the more recent, popular literature. Much of his material was taken from teratological writings, from Van Linschoten, the works of Athanasius Kircher, *De ongeluckige voyagie van 't Schip Batavia* (an extremely popular publication of 1647 describing the voyage, shipwreck, mutiny and massacre of the crew of the *Batavia*), and contemporary pamphlets. The writer shows no interest in natural philosophy, neither did he have any religious intentions at all; the work was presented as a 'sweet' or 'dainty course' for curious readers.⁴³

The strong link with scholarly developments of his day which had given Boaistuau's work its strength and charm is completely lacking in De Lange's Wonderen. The interchangeability between the mirabilia described and illustrated in the *Histoires prodigieuses* and the objects that could be seen in the leading cabinets of curiosities had virtually disappeared. The references to textual and material sources have become uncontrolled borrowings. Descriptions of wonders of nature are lost among the stories of murder, fire, shipwreck and cannibalism. It is an example of the diffuse genre of the popular edition.⁴⁴ An edifying exemplum has become an entertaining story, and a proof of God has become a source of amusement for the long winter evenings. De Lange's Wonderen is not only a symptom of the dilution of the Boaistuau concept, but also an exponent of an endless series of works such as De groote schouw-plaets der jammerlijcke bloed- en-moordgeschiedenissen (Great spectacle of lamentable histories of blood and murder, 1670) or D'eedelste tijdkortingh der weetgeerige verstanden of: De groote historische rariteit-kamer (The noblest pastime of the curious mind, or: the great historical chamber of rarities, 1694), which hacks like Simon de Vries were to put on the market from the 1670s onwards.45

Popular theological works

Generally speaking, the writers of books of wonders based themselves on two types of sources until the second half of the seventeenth century: the Bible, and the enormous corpus of classical and modern works on nature. Although Boaistuau and his followers often referred

⁴³ De Lange, Wonderen des werelds, A2r/v.

⁴⁴ Van Selm, "Almanakken, lietjes, en somwijl wat wonders"; Salman, *Populair drukwerk*.

⁴⁵ Baggerman, Een drukkend gewicht.

to the Bible and to Augustine, the work of the Dutch epigones in particular had a relatively profane character, in the sense that it was primarily based on Pliny, Obsequens and early modern writers such as Gessner, Cardanus and Van Linschoten. This held for Van Duisburg and Sanderus too. However, there were also works that were in the first instance based on the Bible, and in which ancient and contemporary philosophical insights played a subordinate role. The authors were without exception Dutch ministers, and their writings were closer to the tradition of works in hexameters such as Du Bartas' La Sepmaine than to that of the Histoires prodigieuses. They often lacked the attractive illustrations too. Works like those of the minister Le Maire or his colleague De Mey were partly the result of the pastoral task of their authors. They explained to their audience that God's creation should be contemplated in the first instance on the basis of the Bible. Referring to the Epistle to the Romans 1:20, they tried to convince the Epicureans, heathen and other misguided souls 'that they are without excuse'.

An early example of this tendency is provided by the Delft preacher Dionisius Spranckhuysen († 1650). The orthodox minister was a productive writer of edifying literature. In 1634 and 1636 he published two books: *Macro-cosmus*, *ofte aenmerckinghen over de scheppinghe vande groote werelt* (Macrocosm, or remarks on the creation of the big world), and *Micro-cosmus*, *dat is aenmerckingen over de scheppinghe vanden menschen ofte de kleyne werelt* (Microcosm, that is, remarks on the creation of humankind or the small world).⁴⁶ Both works are based on the biblical account of the creation. Spranckhuysen's works provide a good illustration of the popularity of the doctrine of the Book of Nature. In principle, everyone can deduce the existence of God from nature, he claimed with reference to the familiar sources, even 'the dullest peasant in the world'.⁴⁷ But the Fall has so clouded human minds that we are no longer able to decipher the creation without a key to interpretation:

⁴⁶ Spranckhuysen, Macro-cosmus, ofte aenmerckinghen over de scheppinghe vande groote werelt; Idem, Micro-cosmus, dat is aenmerckingen over de scheppinghe vanden menschen. Both works were reprinted in 1646, and later included in: Idem, Opuscula practica, ofte alle de stichtelijke wercken.

⁴⁷ Spranckhuysen, Macro-cosmus, ofte aenmerckinghen over de scheppinghe vande groote werelt, 4–5.

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...that is why God in his goodness has chosen to give us the Book of the Scripture for the Book of Nature, as an interpreter or translator of the same, the one explaining the other. For Nature begins with the Scripture, and leads us step by step above Nature to God.⁴⁸

This is fully in accordance with the orthodox views of the Reformed Church. Spranckhuysen's approach is the same as that of his illustrious predecessor Voetius: the Bible is the compendium of all knowledge, including knowledge of nature. Imprecisions and lacunae in the biblical text on the creation were cleared up by scholastic philosophy. The natural philosophical developments of his day appear to have entirely bypassed the Delft minister.

Spranckhuysen claimed that when we contemplate the creation we are filled with wonder. We ask ourselves, just as when we see a beautiful painting or an excellent book, who the 'author and master' is.⁴⁹ Following the account of the creation in six days, Spranckhuysen successively dealt with the light, the heavens, the sun, moon and stars, the earth, the oceans, the succession of the seasons, the animals and plants, and of course humankind, created in such a way as to be able to contemplate and meditate on the entire creation.

The existence of God, Spranckhuysen considered, could be deduced fro the perfect order of the cosmos. Classical arguments from natural theology, such as the cycle of the seasons, the brackish nature of the sea, the community of ants, the purposiveness of the human body, etc. were discussed in detail. Divine providence could be seen in the order and regularity of nature. A good illustration is Spranckhuysen's reply to the question of why there are far more sheep than wolves in the world, 'since sheep give birth to one, two, or three lambs at most, while wolves give birth to nests full of young?'50 The answer: God in his goodness ensured that, because of their 'frenzied hot temper', the wolves drove one another away with their howls or tore one another to pieces and thus had difficulty in finding a mate. 'Our friendly God arranges it in such a way that the wild animals do not propagate too much to be a harm and nuisance to us'.51 Arguments like these, in which circular reasoning was used to confirm the status quo, which was therefore considered to be a manifestation of divine providence,

⁴⁸ *Ibid*.

⁴⁹ Ibid., 9.

⁵⁰ Spranckhuysen, Microcosmus, dat is aenmerckingen over de scheppinghe vanden menschen, 165.

⁵¹ *Ibid.*, 164.

were to become very popular in physico-theological circles in the eighteenth century.

A second, similar publication in this genre is the Vivum theatrum (Live theatre) that Johannes le Maire published in 1642, the year of his death. 52 He often described God's works in nature as the 'liber naturae, the book of nature, construction and building of the world'.53 Since the Bible was the key to this book, the minister discussed the creation primarily on the basis of the word of God. However, Le Maire had evidently also steeped himself in natural theology in the spirit of Cicero. Moreover, this uncle of the Dutch voyager of exploration Jacob le Maire was very interested in the flora and fauna of the New World. Unlike the cases of his contemporaries Van der Mijle and De Laet, however, this did not create problems of interpretation for him. On the basis of a strictly literal reading of the Bible, Le Maire explained how God had created the universe 'with one word alone', before going on to discuss the six days of the creation in a similar spirit.⁵⁴ The pluriformity and structure of the created world was a particularly convincing proof of God's existence. Le Maire referred in this connection to the vast increase in knowledge about the New World thanks to Vespucci, Magellan and his nephew Jacob. However, he illustrated this idea firstly on the basis of the immeasurability of the heavens, the innumerable number of the stars, and the diversity and complexity of the earth, flora and fauna, and particularly the human body. He systematically dealt with the purpose of each limb, internal organ and sense. For instance, he engaged in a long discussion of the human eye, which was not only an ingenious device 'to better see God's magnificent majesty', but was also a source of wonder in itself because of its complex anatomy.55 The same was true of the stomach, the mouth and the teeth. Le Maire's discourse on the latter is indicative of his spiritual attitude:

 \dots in which device the art of God's providence begins to manifest itself: for the ones in the middle are sharp to break the food, while those at the sides, with a cleft in the middle, like the millstone, are equipped for grinding. ⁵⁶

⁵² See Chapter Two.

⁵³ Le Maire, Vivum theatrum, 409.

⁵⁴ *Ibid.*, 3.

⁵⁵ Ibid., 74.

⁵⁶ Ibid., 93.

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Fig. 65. Besides all kinds of monsters and other praeternatural phenomena, the ordinary course of nature was also a constant source wonder. In his *Beschouwing der wereld* (1708), Jan Luyken meditated upon the sun, referring to Psalm 104: 2 (KB).

Le Maire was quite explicit about the source of this gem of wisdom: he followed his wide-ranging discussion of human anatomy with a long extract 'what Tullius [sc. Cicero in his *De natura deorum*] writes about the senses of our body'.⁵⁷ The discussion of the anatomy of animals is characterised by the same emphasis on purpose and structure. For instance, how can a fully mature bird emerge from a tiny egg? There is thus 'more art and wonder in the making and fabrication of a small bird than of a human body', since the former is considerably smaller than the latter.⁵⁸ The argument that nature is nowhere more whole than in its smallest parts can be traced back to Pliny, and was later to be elaborated in more detail by Swammerdam.

Le Maire was very reticent regarding the subjects that were so popular in the contemporary histories of wonders: the praeternatural cases. The eclipse of the sun and moon was firmly brought within the domain of the natural 'since their course is so regulated, fixed and unfailing'. ⁵⁹ Instead he reviewed many of the biblical *mirabilia*, such as the nature of the fruit that is translated as 'gourd' in *Jonah* 4:6. ⁶⁰ He also paid considerable attention to more modern wonders, such as the West Indian 'Magucij' tree whose many functions had also been celebrated by Van Nijenborgh. ⁶¹ Another example is the *arbor tristis* described by Pliny, which fascinated humanists like Colvius and Vossius. ⁶² 'Which things are all wonders of God', Le Maire wrote, 'from which men can tangibly feel the infinite power of God'. ⁶³

Two similar books published a few decades later are in the same tone. Johannes Feylingius (†1696), a minister in the village of Maarheeze in North Brabant, published *De wonderen van de kleyne werelt* (The wonders of the small world) in 1664; a thoroughly revised and expanded version was published in the following year as *De macrocosmus*, *en microcosmus*, *ofte de wonderen van de groote en kleyne werelt* (The macrocosm and microcosm, or the wonders of the big and small

⁵⁷ *Ibid.*, 86–89. Cf. Cicero, *De natura deorum* II, 140–146.

⁵⁸ Le Maire, Vivum theatrum, 38.

⁵⁹ *Ibid.*, 354.

⁶⁰ Ibid., 221.

⁶¹ Ibid., 35.

 $^{^{\}rm 62}$ Ibid., 352. Cf. the letter of Colvius to I. Vossius, 29 April 1660, BLO Ms d'Orville 270 fol. 3.

⁶³ Le Maire, Vivum theatrum, 353.

world).⁶⁴ This follower of Voetius was also a poet.⁶⁵ Feylingius celebrated the creation and its creator in numerous verses:

God has deposited his holiness in all things; *He can be read* in the tiniest ant and stone.⁶⁶

The familiar metaphors for God's works—the creation is a stage, a mirror, and above all a book—recur in *De macrocosmus* and in Feylingius' poetry. His starting point was the book of *Genesis*. What is more essential than light? What is more immeasurable than the firmament? What is more magnificent than the sun? In his discussion of the six days of creation, the minister leafed through the Book of Nature. A characteristic opening of a new chapter is: 'The last place among the elements is occupied by the earth, a noble leaf in the book of nature'.⁶⁷ The minister concluded his work 216 pages further on with the prayer: 'Oh almighty and good creator of that majestic building, we have read your great book and seen its pages. Your creatures are letters, and many creatures, many phrases glorify your name'.⁶⁸

Admiratio is the key word here. Exceptional events are attributed to divine providence too. For instance, Feylingius wrote on comets:

...they are witnesses of God's wisdom, for while the long duration of the benefits of the common wonders of God (such as the sun and moon) dulled our eyes to them, almighty God has intended these extraordinary instruments to terrify and warn us.⁶⁹

The prodigious, which was so emphatically presented by Lycosthenes as a sign of divine wrath and had already been more or less naturalised by Boaistuau, is here virtually stripped of its ominous character. Feylingius' God is friendly and helpful rather than wrathful, as his comments on trees show:

They are a grace to the earth, shade for the traveller, a resting place for the birds, so that human cares might be whiled away by their natural

⁶⁴ Feylingius, De wonderen van de kleyne werelt; Idem, De macrocosmus, en microcosmus, ofte de wonderen van de groote en kleyne werelt.

⁶⁵ Stronks, Stichten of schitteren, 36-37.

⁶⁶ Feylingius, Het bloem-hofje der gedichten, 'Op de geschapenen natuere', 51. Italics are mine.

⁶⁷ Feylingius, De macrocosmus, en microcosmus, ofte de wonderen van de groote en kleyne werelt, 56.

⁶⁸ *Ibid.*, 216.

⁶⁹ Ibid., 80.

music!...It is through the power of God that sap comes to the trees in the spring, which had almost died during the winter. This sap produces leaves and fruit. No artist is capable of producing an apple or grape from this sap: this is a work of almighty God alone.⁷⁰

It is evident that the arguments of Spranckhuysen, Le Maire and Feylingius are entirely in the spirit of the Belgian Confession and the Further Reformation. The creation was presented as a book, theatre, cabinet or macrocosm in which humankind could contemplate God's almightiness. The metaphors are more or less interchangeable, with a great predilection for the metaphor of the Book of Nature. Wonder was primarily provoked by the order and regularity of the world, and it is no coincidence that God was often referred to as an architect. These themes are often associated with eighteenth-century physicotheology in the spirit of Ray, Derham and Nieuwentijt, but it should be emphasised that such views already had a very long theological tradition. The a priori of Spranckhuysen, Le Maire and Feylingius is clear: the Book of Grace is the timeless, self-explanatory key to a true Christian reading of the Book of Nature. By the middle of the seventeenth century, however, this axiom was coming under increasing attack, and this change did not fail to affect the genre of the books of wonders either.

3. Johannes de Mey: between exegesis and experiment

By the middle of the seventeenth century, Dutch books of wonders were essentially compilations. Wonder at God's works was provoked in the first instance by references to texts and stories. Boaistuau's successors were in danger of getting stuck in an endless series of repetitions which obscured both directly perceptible nature and the original written sources. Dutch ministers, on the other hand, remained faithful to the letter of the Bible. Although they displayed a certain sensibility towards the long tradition of natural theology and more modern natural histories, they paid no heed to the rapidly changing natural philosophical insights and, above all, the emergent discipline of textual criticism. In other words, all of these writers were imprisoned in the textual tradition. An important figure in this connection is Johannes

⁷⁰ Ibid., 116-117.

de Mey, whom we have already come across in connection with his speculations on comets and insects. De Mey played an extremely interesting role in the development of the books of wonders. His approach could be characterised as an attempt to study both the Bible and the Book of Nature as Urtext. De Mey tried to go back to the sources of both books by studying the Bible on the basis of the extant Hebrew and Greek texts, and nature on the basis of modern natural philosophical works and his own observations. A Leitmotiv in the work of the minister and natural philosopher is God's revelation in the creation, a theme that he elaborated in a popular work with the revealing title Halelu-jah, of lof de Heeren verbreydt op het natuer-toneel (Hallelujah, or praise the Lord, demonstrated on the stage of nature), which was first published in 1666. It was reprinted in the following year, later included in the collected works of De Mey which were published in 1681, and were reprinted in expanded versions in 1704, 1706 and 1742.71

De Mey was a neglected figure for a long time.⁷² He did not really belong to the scientific mainstream of his day and was not close to such leading figures as Descartes, Huygens senior and junior or Vossius senior and junior. His work belongs to the tradition of other ministers from Zeeland such as Hondius and Lansbergen, for whom piety and natural inquiry were one. He can also be compared with his contemporary Colvius, whom he knew personally and whose cabinet of curiosities he visited.⁷³ Like his colleague in Dordrecht, De Mey was a very well-read eclectic who closely followed the latest literature in the fields of exegesis and natural philosophy. Unlike Colvius, De Mey was a very productive writer.

De Mey studied theology and medicine in various places and was receptive to contemporary developments in natural philosophy. He also went on a number of journeys: he visited England, Switzerland and Germany, and obtained his title as *medicinae doctor* in Valance. He was a minister on the Caribbean island of St Eustatius from 1643 to 1644. In 1649 he was called to Middelburg. He was extremely eloquent and was well-known everywhere for his kind character. His exegetical expertise led to his appointment to the committee to correct the

⁷¹ Here quoted after: De Mey, *Al de Nederduitsche werken*. For bio- and bibliographical details see: Zuidervaart, 'De Mey', 28–31.

⁷² De la Ruë, Geletterd Zeeland, 99-116; Zuidervaart, 'De Mey'.

⁷³ De Mey, Al de Nederduitsche wercken, 777.



Fig. 66. Now largely forgotten, but rather popular in the late seventeenth and eighteenth century Dutch Republic: the books by Johannes de Mey, minister and natural philosopher. This is the frontispiece of the first edition of his collected works in Dutch (1682) (KB).

mistakes in the first edition of the official Dutch translation of the Bible (the *Statenbijbel*) in 1654.⁷⁴ He was also active in the academic world: in that same year he was appointed to the governing body of the Illustre School in Middelburg, where he became professor of philosophy in 1672 and taught the physics of the renegade epigone of Descartes, Henricus Regius.⁷⁵ His academic career was not entirely without problems, as Middelburg, like Utrecht and Leiden, was the arena of followers of Voetius and Cocceius.⁷⁶

De Mey did not go all the way with Cocceius or Descartes; he was an eclectic. He summed up his own epistemology as follows: 'nobody can judge a matter justly and well until he has acquired a thorough and adequate knowledge of it'.' These were no empty words. De Mey's critical spirit led him along numerous paths of inquiry. For instance, in the 1660s he investigated accusations of magic in a manner very reminiscent of Bekker's *Betoverde weereld* (1691–1694).

It is, however, De Mey's vision of the relation between the Bible and the Book of Nature that is central here. He attempted to achieve a synthesis between the *Urtext* of the Bible and the natural philosophical insights of his day, in other words, between God's revelation in the Holy Scripture and his works in nature that were visible to all. De Mey did not see any contradiction between the biblical text and natural philosophy. Even for the Cartesian, the dictum of Ecclesiastes 1:9 that 'there is no new thing under the sun' still held.⁷⁹ For De Mey Cartesianism was not a revolutionary innovation, but 'was derived from the writings of antiquity'.80 By studying the Bible and nature rationally, and thus without scholastic ballast, he believed that people could return to the original sources of knowledge of God. As he paraphrased the Epistle to the Romans 1:19-20: everyone can 'see and understand God's invisible things and what may be known of God' in nature.81 De Mey thus championed natural theology. As he explained at many points in his work, the wisest among the heathen can also arrive at the

⁷⁴ De Bruin, De Statenbijbel en zijn voorgangers, 312–317.

⁷⁵ De la Ruë, Geletterd Zeeland, 66; Frijhoff, 'Zeelands universiteit'.

⁷⁶ De Mey, Apologie... gedaen voor het bevestigen van Do. Guilhelmus Momma; Van der Bijl, Idee en interest, 25–29; Israel, Dutch Republic, 820.

⁷⁷ De Mey, Al de godgeleerde en natuurkundige wercken, 405–406.

⁷⁸ Cf. Geerdes, 'De duivel en het bedrog'.

⁷⁹ De Mey, Al de godgeleerde en natuurkundige wercken, 404.

⁸⁰ De Mey, Al de Nederduitsche wercken, 735.

⁸¹ De Mey, Al de godgeleerde en natuurkundige wercken, 317.

insight that God exists by contemplating nature.⁸² Besides Christian authorities such as Augustine, Du Plessis de Mornay and Gerardus Vossius, De Mey also cited Cicero and Seneca as witnesses.⁸³

Like Colvius, De Mey considered that the study of nature alone led to pantheism, superstition and idolatry: 'Without the Gospel, the heathen are estranged from the covenants of promises and have no hope'.84 Without the Bible the most rational among the heathen can deduce that there is a God, but they will never know who he is. So far this was entirely in accordance with the orthodox views of the Reformed Church. But unlike such writers as Danaeus and Voetius, De Mey argued that using the Bible to interpret nature was not without its problems. It is extremely important to note that De Mey realised that the Bible was unclear on many points. As he remarked, the Christians are not even in agreement on exactly which books belong to the biblical canon, let alone on whether they can explain them unambiguously. The corrector of the Statenbijbel himself repeatedly complained about the obscurity of biblical phrases, faulty translations or incorrect commentaries: 'Many texts seem to be in contradiction with one another because many words occur in the original languages of the Sacred Scriptures that can be interpreted in different ways'.85

The Sacra physiologia

Exegesis is one of the foundations of De Mey's work. A large part of his publications consist of explanatory comments on the Bible. ⁸⁶ These works are interesting for two reasons: first, because De Mey has a great predilection for passages on natural phenomena; second, because of the method he followed. De Mey was closer to Calvin's accommodatory vision than to Voetius' very literal biblical interpretation. Moreover, De Mey claimed, obscurities and mistakes had crept into the translations of the Bible at many points. A major problem was that 'some words in the Hebrew text have become so unfamiliar in the course of time that even the Jews of today are not certain of how to

⁸² See for example: De Mey, Al de Nederduitsche wercken, 119–121; Idem, Al de natuurkundige en godgeleerde wercken, 581–884.

⁸³ De Mey, Al de Nederduitsche wercken, 119-121; 352-357; 591-595.

⁸⁴ De Mey, 'Tweespraeck tusschen een Christen en een Heyden' in: Idem., *Al de Nederduitsche wercken*, 309–315, quotation on 308–309.

⁸⁵ De Mey, Al de Nederduitsche wercken, 85.

⁸⁶ De Mey, Uytleggingen en bedenckingen; Idem, Expositio aliquot locorum Pentateuchi.

understand and translate them best'. This gave particular problems in relation to biblical *naturalia* and natural phenomena, De Mey stated. Like such illustrious scholars as Scaliger and Isaac Vossius, he tended to regard the traditional books of the Bible in the first instance as historical documents and to raise questions about the context in which they had taken shape.

After all, it cannot be denied that the historical events of the Old Testament, and likewise the genealogies..., many sacrifices, ceremonies, civil laws and such things had a particular use and were accommodated to the diverse states, places, times and circumstances of the Jewish nation.⁸⁸

He wondered whether Paul might have written a third *Epistle to the Corinthians*, and whether the apostle really was the author of the *Epistle to the Hebrews*, as 'the style of writing in this letter is very different from that of the Pauline Epistles'.⁸⁹ After extensive philological reasonings, the latter question was eventually resolved in the affirmative, but the question itself is typical of his approach to textual criticism. De Mey also wrestled with problems bearing on language, such as that of which language was spoken in Paradise, how long Hebrew had maintained its purity, and whether all the languages of the world could be derived from the Flood and Babel.⁹⁰ Like Vossius, De Mey also gave much thought to the question of whether all the books of the Old Testament had gone up in flames during the destruction of Jerusalem.⁹¹ This is far from the crystal-clear world of Voetius, for whom the Bible was the transparent and timeless revelation of God.

One book is of particular importance in this connection: the *Sacra physiologia*, first published in 1655. ⁹² It can be regarded as an exponent of biblical zoology, the form of exegesis to which Protestant theologians felt particularly attracted. Examples are the *Historia animalium sacra* of Franzius (1592) and the famous *Hierozooicon* of the Huguenot Samuel Bochartus, which was published in 1663, not many years after De Mey's *Sacra physiologia*. Like Bochartus, De Mey based his

⁸⁷ De Mey, Al de Nederduitsche wercken, 85.

⁸⁸ *Ibid.*, 555.

⁸⁹ *Ibid.*, 155, 168, 201–202.

⁹⁰ Ibid., 801-802. Cf. Céard, 'De Babel à la pentacôte'; Bono, Word of God.

⁹¹ De Mey, Al de Nederduitsche wercken, 90.

⁹² Here quoted after the Dutch translation, Heylige natuur-beschrijving ofte uytleg der schriftuur-plaatsen in de welcke van natuurlyke dingen gehandeld word, included in: De Mey, Al de natuurkundige en godgeleerde wercken, 213–624.

arguments not only on the original Hebrew and Greek texts of the Bible, but also on works of natural philosophy and natural history of his own day. Moreover, De Mey also brought his own observations into the discussion. In line with his conviction that the Christian faith was a rational religion, he displays a strong tendency to give natural explanations for natural phenomena described in the Bible. A well-known problem, which Calvin had already discussed, was that of how to interpret the waters above the heavens mentioned in *Genesis* 1:7 and *Psalm* 148:4. De Mey saw nothing in a literal interpretation; he took these waters to be clouds.⁹³ 'Behold even to the moon, and it shineth not; yea, the stars are not pure in his sight' (*Job* 25:5) triggers an account of the discovery of sunspots attributed to Galileo.⁹⁴ Another passage in the book of *Job* (10:10–11) prompts De Mey to confirm this biblical text too on the basis of modern insights:

Hast thou not poured me out as milk, and curdled me like cheese? Thou hast clothed me with skin and flesh, and hast fenced me with bones and sinews.

This passage leads to extensive reflections on the construction of the human body, and in particular the recent discovery of the milk and blood vessels. De Mey defended the theory of the circulation of the blood as formulated by Harvey and propagated by Regius.⁹⁵

De Mey's hermeneutic interest targeted a whole series of very specific questions that had served as material for pious reflection in the older books of wonders. Had there been giants in the past, as *Genesis* 6:4 stated? The original Hebrew text had been translated correctly, and De Mey had seen a monstrously large tooth and thigh bone in London, which he had been assured had been found in the grave of a giant. ⁹⁶ Similarly, when it came to the description of the embalming of the body of Joseph at the end of *Genesis*, De Mey explained that the Egyptians used to mummify their dead at the time; this technique made it possible to preserve human bodies for centuries, 'for I myself have once seen a human body that had been desiccated beneath the hot sand in Arabia'. ⁹⁷ Of course, all these *miracula* and *mirabilia* were the

⁹³ De Mey, Al de natuurkundige en godleerde wercken, 323.

⁹⁴ *Ibid.*, 486.

⁹⁵ Ibid., 475-481.

⁹⁶ Ibid., 342.

⁹⁷ Ibid., 362.

work of God, but he brought them about in the first instance by natural rather than supernatural means. When Moses turned brackish into fresh water (Exodus 15:25), this result was probably due to the powers of the tree that he had cast into the waters, or to a related technique of distillation: 'it is known that sea water in wells close to the shore is filtered through the sand to become sweet and fresh'.98 The precious stones mentioned in *Exodus* 28:17–20 induce De Mey to expatiate on their supposed miraculous properties. For instance, according to Boaistuau, who repeated a view that went back to Pliny, the stone astriotes ('Stellina or star-stone', probably a moonstone) had a natural antipathy to vinegar and moved if the latter were nearby.99 'That has not been demonstrated in my experience', was the considered verdict of De Mey. 100 When Boaistuau attributes such characteristics to the diamond as invulnerability to hammer blows and the capacity to throw magnets into confusion, De Mey called for experience to be our guide: he had put the theory to the test and seen both that diamonds can be crushed by a small hammer and that they have no influence on magnets. 101 When it came to biblical flora, De Mey drew on contemporary natural histories of the Holy Land to try to identify them. For example, lengthy philological and botanical disquisitions led him to the conclusion that the miraculous tree under which Jonah found shade (Jonah 4:7) was the prosaic castor oil tree described by Dodonaeus. 102 De Mey followed the same approach in his attempts to identify biblical fauna. In some cases their lack of expertise or sloppiness had led the translators of the Bible not to translate the names into Dutch, but to leave them as they had found them in the Hebrew text. De Mey therefore racked his brains to identify the biblical Behemoth and Leviathan. 103 This was an extremely popular problem among exegetes and *curieux*, and had led to a variety of conclusions. Behemoth was described in *Iob* 40:15-21:

Behold now behemoth, which I made with thee; he eateth grass as an ox. Lo now, his strength is in his loins, and his force is in the navel of

⁹⁸ Ibid., 373.

⁹⁹ Pliny, Naturalis historia XXXVII, xlvii; Boaistuau, Histoires prodigieuses, 136.

¹⁰⁰ De Mey, Al de natuurkundige en godgeleerde wercken, 381.

¹⁰¹ Boaistuau, Histoires prodigieuses, 137.

¹⁰² De Mey, Al de natuurkundige en godgeleerde wercken, 568-569.

¹⁰³ Behemoth see: *Job* 40:10; Leviathan: *Job* 40:20; *Psalm* 74:14; *Psalm* 104:26; *Isaiah* 27:1.

his belly. He moveth his tail like a cedar: the sinews of his stones are wrapped together. His bones are as strong as pieces of brass: his bones are like bars of iron. He is the chief of the ways of God: he that made him can make his sword to approach unto him...He lieth under the shady trees, in the covert of the reeds, and fens.

Paludanus and Witsen had claimed that Behemoth was a hippopotamus.¹⁰⁴ After much deliberation, De Mey eventually arrived at the plausible conclusion that it was an elephant. As for Leviathan, he took it to be a whale.¹⁰⁵

Sometimes, however, the translators of the Statenbijbel had made a courageous attempt to translate the original Hebrew name into Dutch. De Mey called into question some of their identifications. An illustrative example is that of the unicorn. The extant Hebrew text of the Old Testament refers in a number of places to the animal re'em, which was translated into Greek as monokérotos, unicorn. This interpretation lay behind the highly popular Christian representations. 106 Re'em was also consistently translated as 'unicorn' in the Statenbijbel. De Mey considered that translation to be incorrect, and that it was 'to this very day uncertain which animal is indicated by the Hebrew word Reem'.107 De Mey collated all the biblical descriptions of the re'em with the natural historical knowledge of antiquity and of his own day. What many people took to be the horn of a unicorn was in fact the tusk of a fish, as De Mey had seen with his own eyes in a collection of curiosities, although he did not rule out the possibility of a terrestrial unicorn. The only problem was that the unicorn had never been spotted in the Near East, and thus it was impossible for the Bible to refer to this animal. In the end De Mey concluded that the re'em of the Old Testament must be the same as the creature called *Urus* by the Romans, which was an aurochs. 108 De Mey was one of those who undermined the traditional symbolism of the unicorn, not only on the basis of sense perceptions, but also by means of a thorough sifting of the original textual sources to which this creature owed its existence. 109

¹⁰⁴ KBK Ms K.S. 3467,8 fol. 30/r; Witsen, *Tartarye*, 747.

¹⁰⁵ De Mey, Al de natuurkundige en godgeleerde wercken -533.

¹⁰⁶ Shepard, Lore of the Unicorn.

¹⁰⁷ De Mey, Alle de Nederduitsche wercken, 85.

¹⁰⁸ De Mey, Sacra physiologia, 174-180; Idem, Al de Nederduitsche wercken, 85-86; Idem, Al de natuurkundige en godgeleerde wercken, 413-416.

¹⁰⁹ Cf. Shepard, Lore of the Unicorn; Gerritsen and Jonker, De eenhoorn en de geleerden, 37–38.

378 Chapter six

Halelu-jah, of lof de Heeren verbreydt op het natuer-toneel

We have seen that one of the foundations of De Mey's work was his philological expertise, but this cannot be detached from the second foundation: De Mey's great interest in the research on nature of his day and his own empiricism. This resulted in two works based on natural philosophy: Halelu-jah, of lof de Heeren verbreydt op het natuertoneel (Hallelujah, or praise the Lord, demonstrated on the stage of nature, 1666) and Het tweede halelu-jah, ofte Lof des Heeren, verbreyt op het genaden-toneel kortelijck vertoonende den lof en wonderen Gods, in het werck der verlossinge (The second hallelujah, or praise of the Lord, demonstrated on the stage of grace, briefly showing the praise and wonders of God in the work of redemption, 1667). These popular books were reprinted and incorporated in all of the various editions of De Mey's collected works.

In both publications De Mey dealt with the creation on the basis of philosophical speculations and his own observations. Here too he showed himself to be an eclectic. Although De Mey's work was certainly not one of the prominent scientific publications of his time and displayed an ignorance of such scientists as Boyle, Hooke and Huygens, it does give an impression of how slightly less recent natural philosophical ideas were digested. The emphasis, as in the theological works of Spranckhuysen and those of a similar persuasion, is very much on the order, regularity and purposiveness of nature. In De Mey's case, this principle is founded not only theologically, but also in terms of natural philosophy. A common denominator of the authors whom he cites such as Descartes and Gassendi is that they could provide a natural, rational explanation for every aspect of the creation in the form of a theory of particles. De Mey subscribed wholeheartedly to this view. In seeking the causes of 'natural things', investigators should not resort to 'hasty pseudo-arguments, word games or exceptions', but should 'determine a fixed reason'. 110 De Mey also emphasised the importance of the senses, which is one of the aspects that makes his works so interesting. He made his own observations with the telescope and microscope, conducted experiments, and went to see as many natural curiosities as possible during his travels abroad. Allusions in his work give the impression that he was himself a collector of naturalia; at any

¹¹⁰ De Mey, Al de Nederduitsche wercken, 414.

rate, he had certainly visited the cabinets of Paludanus and Colvius and regarded them as exemplary models.¹¹¹ Earlier Dutch authors of books of wonders hardly ever referred to their own perceptions. The result was a corpus compiled from corruptions and misinterpretations in which the same anomalies were presented with a redundancy that must have been mind-numbing to the contemporary inquirer.

De Mey had already relegated the importance of such *mirabilia* to the margin in his *Sacra physiologia*. The two *Hallelujahs* contained the same message. Research on nature was conducive to piety provided it was carried out with a critical mind. In the introduction to the first *Hallelujah*, De Mey repeated a familiar theme. His book was written to the greater glory of God:

By indicating, explaining and bearing witness to the ineffable and innumerable secrets and wonders that occur in all of God's works...which are noted by very few people, and properly understood by even fewer.¹¹²

De Mey's work is systematic. He adheres to the framework of the book of *Genesis* for the creation of the world, supplemented by physical theory. This is a natural philosophical system of his own making, in which he treats six themes in succession: natural bodies, the earth, the terrestrial fauna and flora, meteorology, and the sky and stars. Chance is ruled out; everything follows a divine plan. This conviction is the main weapon against Epicureans and other atheists. According to De Mey, the creation consists of a number of elements and minuscule particles, though he does not go into details. Just as an infinite number of words can be formed using a limited number of letters, God has created an infinite number of creatures on the basis of these constituent materials. De Mey repeatedly draws attention to the existence of unity in diversity and diversity in unity. Anyone who examines the matter closely can see that no two bees are alike. He can detect here a clear shift from symbolism to structure.

De Mey constantly combines a literal reading of the Bible with his own physical insights. Descriptions of the motion of objects as they fall are connected with his reflections on the centre of the earth and authorised by *Job* 38:4–6: 'Where wast thou when I laid the foundations

¹¹¹ Ibid., 493, 777.

¹¹² Ibid., 413.

¹¹³ Ibid., 431-438.

¹¹⁴ Ibid., 424.

of the earth?... Whereupon are the foundations thereof fastened?'. On the question of whether the earth is in motion or not De Mey adduces arguments for and against before concluding: 'Since there has been so much debate on the topic, we shall not go further into it here'.' He studied the sun and the moon with the aid of a telescope. He enthusiastically reports on the 'fiery and seething waves and thick mists and smoke' on the sun, and the 'lofty, steep and jagged mountains, cliffs and rocks' on the moon, using engravings from Kircher and Galileo to illustrate them. De Mey also refers to the declination of magnets in this connection: he has himself observed that the needle of the magnet deviates from its true course after large-scale volcanic eruptions. He accounts for this in terms of the effect of the particles emitted on the 'pores or tiny openings' in the needle—a clearly mechanistic explanation. He

Organic nature is also a source of wonder. De Mey has little to say on plants. Most of his attention is lavished on a borderline case between animal and plant: the Lamb of Tartary called Borametz. Like most scholars of his day, De Mey believes in the existence of this anomaly. Referring to his own observations, he discusses several tropical trees before concluding succinctly that there are so many types of plant 'both in the Indies and in other countries that it is impossible to calculate every kind of them, which is a clear proof of the inscrutable wisdom of God'. Magical, allegorical and symbolic considerations are entirely absent. De Mey writes that he has 'dealt more extensively with the precious stones' in his *Sacra physiologia*,

And in particular with those which were in the breastplate of the high priest, *Exod*. 28:17. We also pointed out there that not everything should be accepted without question about the properties and effects of stones as some have written, for experience shows that many such stories have been found to be untrue.¹¹⁹

Neither had it ever been demonstrated that the chameleon or any other creature lived entirely on air. 120 Phenomena such as storms,

¹¹⁵ *Ibid.*, 440. See also: Zuidervaart, 'De Mey', 11–12; Vermij, *Calvinist Copernicans*, 322–323.

¹¹⁶ De Mey, Al de Nederduitsche wercken, 497–498.

¹¹⁷ *Ibid.*, 452.

¹¹⁸ Ibid., 456.

¹¹⁹ *Ibid.*, 446.

¹²⁰ Ibid., 457.

earthquakes and thunder and lightning have purely natural causes and no supernatural significance. The same is true of comets. ¹²¹ There is a rational explanation for everything, and when all is said and done it goes back to divine providence. Some small creatures multiply so rapidly because 'God has disposed nature thus in his wisdom, to provide food for other animals'. ¹²² The propagation of the human and higher animal species also shows the wisdom of the Lord, as can be seen from the fact that humans enjoy the act of copulation. De Mey regards this physical pleasure as an expression of the unfathomable providence of God. Of course, the mingling of matter leads to 'inconvenient dirtiness and repugnance'. However, it is as the omniscient creator has arranged:

If there were no particular pleasure in procreation, humans and animals would abandon it, so that the animal species would become extinct; particularly as procreation and rearing are a matter of great effort and concern, especially among humans.¹²³

It is unlikely that a Dutch minister ever came up with a more original proof of the existence of God.

Other facets of human anatomy and physiology are likewise taken to be signs of God's omnipotence. The human eye is the pretext for a long account of the importance of sense perceptions and their usefulness for religion and science. The working of this organ is explained by means of a Cartesian-style theory. It is characteristic of De Mey's approach that he concludes this explanation with a call to construct a *camera obscura* 'so that this great miracle of nature can be understood' and with the remark that the eye 'is rightly called a special work of God in the Holy Scripture Ps. 94.9: *He that formed the eye, shall he not see?*' 124 Natural theology and revealed theology proceed hand in hand.

In the light of this background, it is not surprising that De Mey's work was controversial. Immediately after publication it was heavily criticised by Petrus Appeldoorn, a minister with a reputation for petulance. ¹²⁵ Appeldoorn's wrath was concentrated on what he regarded as

¹²¹ De Mey, *De natura cometarum* in: Goedaert, *Metamorphosis...Cum commentariis d. Joannis de Mey* I, 201–235.

¹²² De Mey, Al de Nederduitsche wercken, 458.

¹²³ *Ibid.*, 477-478.

¹²⁴ Ibid., 465.

¹²⁵ De la Ruë, Geletterd Zeeland, 104–105; Van Troostenburg de Bruijn, Biografisch woordenboek van Oost-Indische predikanten, 13–14.

too much emphasis on natural theology and unorthodox exegesis. His attack was so venomous that the magistrate of Middelburg had him arrested and expelled. 126 It was partly in reaction to this affair that De Mey published the second *Hallelujah* in 1667. The subtitle of this work, 'praise of the Lord, demonstrated on the stage of grace, briefly showing the praise and wonders of God in the work of redemption', is relevant, for in it De Mey deals with the accusation that the first Hallelujah 'had seldom, in fact almost never, dealt with or mentioned Christ'. 128 This was a problem that was bound to confront any defender of theologia naturalis sooner or later. De Mey had hardly gone explicitly into the doctrine of the Book of Nature in his first Hallelujah, and the subtitle of the work was motivated by the more secular notion of the theatre of the world. Was this a consequence of De Mey's observation that the Bible was at times a problematic key to the secrets of nature? We can only speculate on this possibility, though it is certainly probable. At any rate, the second Hallelujah refers more explicitly to the Book of Nature. The Middelburg rector Izaak van Hoornbeek (1655–1727) wrote in a dedicatory verse:

There are two books, Christians, two books out of all books, That show God who is not for [naked] eyes to see. His word and nature.¹²⁹

The emphasis on God's revelation in the Bible detonates any possible objections to an over-rationalist approach. According to De Mey, his work is explicitly in accordance with the second article of the Belgian Confession and the views of the Reformed Church on the relation between the Book of Grace and the Book of Nature. This is orthodox, although his emphasis differs from that of the supporters of the Further Reformation.

The work of De Mey in a wider perspective

De Mey is of particular interest in the present context for four reasons. First, he is an exponent of the broad group of Dutch theologians who took an interest in modern natural inquiry for religious reasons.

¹²⁶ See: De Mey, Petri Appeldoorns wee, van hem selfs, over sich selven, gerechtvaerdelijck en opentlijck uytgeroepen, in: Idem, Al de Nederduitsche wercken, 853–864.

¹²⁷ De Mey, Al de Nederduitsche wercken, 525-572.

¹²⁸ *Ibid.*, 527.

¹²⁹ Ibid., 622.

Second, more specifically, De Mey achieved a synthesis between works in the spirit of Boaistuau (in which the emphasis was on the manifold aspects of nature, primarily based on scientific literature) and those of writers like Spranckhuysen (who took the Pentateuch as their starting point). De Mey integrated both forms to create a coherent discourse in which the Bible and natural philosophy complemented one another. Third, he raised both subgenres to a higher plane. Both the Dutch followers of Boaistuau and the ministers were essentially the prisoners of their own textual tradition. The resulting hypertrophy of texts obscured both the Bible and nature from sight. The parallelism between the Bible and the Book of Nature was in danger of being lost now that the interpretation of both books was increasingly under discussion. Originality and profundity were not a first requirement of the books of wonder, but it was unwise for anyone who wanted to draw the attention of wide sectors of the population to God's revelation in nature to fall back on threadbare clichés, outdated information and dubious analogies. By 1665, anyone who deployed the horn of a unicorn or a footless bird of paradise to provoke gasps of admiration at God's omnipotence was likely to be met with indifference, at least within the broad circle of the curieux. It is symptomatic that in 1669 a merchant from Hoorn had to place an advertisement in the Oprechte Haerlemse Courant to sell his 'long and beautiful unicorns'. 130 A new era called for new sources of wonder.

De Mey's work can be characterised as an ambitious attempt to combine the more recent insights into exegesis and natural philosophy in a coherent argument. He went back to the 'original text' for a new interpretation of both books. He studied the Bible with the aid of trilingual philology, while for the study of nature he used modern natural philosophical literature and his own eyes. De Mey adduced sense perceptions and artefacts from collections of curiosities as evidence and regularly described experiments that he had conducted himself.

The fourth aspect is closely connected with the other three. The view expressed by De Mey that modern insights in natural science could be deployed to convince atheists is also one of the most striking features of Nieuwentijt's famous *Regt gebruik*, which was published in 1715, half a century after the Hallelujahs. Like Nieuwentijt, De Mey undeniably tended to project modern insights into the natural order

¹³⁰ Oprechte Haerlems Courant, 28 December 1669.

onto the Bible. In Nieuwentijt's case it was in the last instance the orthodoxy of the Reformed Church that determined how a physical given described in the Bible was understood. De Mey seems to have done the opposite by subordinating exegesis to insights in the natural sciences. Sometimes this led to a demystification of the biblical mirabilia. De Mey jubilantly offered all sorts of natural explanations for miraculous phenomena and enigmatic names. His published works show that he could take this to great lengths. Other sources, including copies of his no longer extant books of notes, sometimes provide even wilder examples. These extracts indicate that in 1668 he witnessed the demonstration of a sort of magic lantern. The projection of all kinds of images on the wall immediately brought to De Mey's mind the familiar biblical passage (Daniel 5:5–30) about the writing on the wall, describing how the words Mene, Mene, Tekel, Upharsin suddenly appeared on the wall at the feast of Belshazzar. Only the prophet Daniel was able to understand them. This was no enigma to De Mey: this divine sign had probably been produced by God with a simple optical device.¹³¹ This is close to the notorious chapter on miracles in Spinoza's Tractatus Theologico-Politicus (1670). De Mey's perception of the relation between God and nature was very different from that of the controversial philosopher, as was the answer to the question of whether a supernatural significance could be attached to exceptional natural phenomena, but with hindsight they can be seen to share the tendency to provide a rational explanation for all kinds of wonders on the basis of the original Hebrew text of the Old Testament.

If we turn to the influence that De Mey's work had, the sources are virtually silent on its reception during his lifetime. Three years after his death, in 1681, almost his entire oeuvre was collected. One has the impression that his work was widely read, although it is extremely difficult to determine the public. Auction catalogues of libraries may give an indication, although as sources they are notoriously difficult to interpret. We do know that Andreas Colvius had an exemplar of the *Sacra physiologia*, and the same work, as well as De Mey's collected works, was in the library of Balthasar Bekker. It could be argued that De Mey's criticism of the fear of comets and accusations of magic are precursors of Bekker's better-known works. It is interesting that De

¹³¹ Zuidervaart, 'De Mey', 26.

¹³² Catalogus librorum Ándreae Colvii, B2/v; Catalogus librorum Balthasari Bekker, 6, 9.

Mey played an important subsidiary role in a splendid roman à clef by Johannes Duijkerius, Het leven van Philopater (Life of Philopater, 1691), which describes how a theology student who has dropped out is transformed from a devote Pietist to a self-assured Spinozist. 133 The very first pages of the novel describe how Philopater, who is suffering from diabolical delusions as the result of too much reading of Voetian writings, is treated by 'a famous teacher from Zeeland', De Mey. 134 This opponent of the 'animal-like stupidity concerning the true nature of religion' cured Philopater from his 'mad illnesses' by using 'natural means'. 135 He instructed the young student 'to learn to have a better understanding of the causes and nature of sublunary things, and to uproot idolatrous and blind superstition root and branch', and thus to proclaim the glory of God. 136 Unfortunately for Philopater, the upright preacher of peace met an untimely death.¹³⁷ The implication of De Mey's heroic role is not only that he was a well-known enough figure to appear in this satirical novel, but that his work could be read as a prelude to Spinozism.

Philopater brings us naturally to the major opponent of Spinoza, Bernard Nieuwentijt. It is unclear whether De Mey had any influence on him. Nieuwentijt nowhere mentions De Mey, although the latter was cited at least twenty times in another popular physico-theological work, the book on Job's knowledge of nature by the Swiss Jacob Scheuchzer (1672–1733). It is usually assumed that physico-theology was an English movement that spread in Protestant Europe at the end of the seventeenth century, and that it was both a part of the time-hallowed tradition of natural theology and an exponent of a movement heralded by Boyle's *A disquisition about the final causes of natural things* (1688), Ray's *The wisdom of God manifested in the works of the creation* (1691) and Derham's *Physico-theology or, a demonstration of the being and attributes of God, from his works of creation* (1713). 139

¹³³ Duijkerius, *Het leven van Philopater & Vervolg van 't leven van Philopater*. Ed. Maréchal. See also: Israel, *Radical Enlightenment*, 316–318–319; Van Bunge, 'Philopater'.

Duijkerius, *Philopater*. Ed. Maréchal, 68–77.

¹³⁵ *Ibid*., 69.

¹³⁶ Ibid., 70.

¹³⁷ Ibid., 77.

¹³⁸ Scheuchzer, Jobs heylige natuur-kennis, passim.

¹³⁹ See for example: Bots, *Tussen Descartes en Darwin*, 5–6 and passim; Stebbins, *Maxima in minimis*, 9–10.

It has been claimed that the traditional idea that God was revealed in his creation appeared in a new guise at the end of the seventeenth century, as the introduction of natural scientific methods in research on the creation meant an appeal to factual inquiry. This empiricism was largely motivated by a rejection of rationalist and materialist philosophies in the spirit of Descartes and Spinoza. Nieuwentijt, largely inspired by British examples, has been taken to be the first Dutch exponent of that empirical, experimental method.

However, it is evident that the work of De Mey calls this vision of Nieuwentijt into question. After all, to a large extent he made use of new natural scientific methods and tried to deploy them for a religious and philosophical programme. Those scientific methods were mechanicism, which was to be so looked down upon later, but also a procedure that we can only regard as a precursor of the experimental method that was to become so popular in the eighteenth century. Moreover, the characteristic tendency of Nieuwentijt to see confirmation of the results of modern natural inquiry in the text of the Bible was already displayed by De Mey. He reinterpreted the Bible in the light of the findings of natural inquiry, while Nieuwentijt claimed to adapt natural inquiry to the demands of exegesis, but the net result was the same: modern natural scientific insights were also enshrined in the text of the Bible.

There certainly are important differences between De Mey and Nieuwentijt, but they both incorporated modern natural philosophical insights and discoveries in an apologetic discourse. There was already a considerable amount of empiricism and the desire to experiment in the case of De Mey. There were no calls to the readers to undertake tests with air pumps and thermometers themselves, but exhortations to acquire the resources that had already been popular for half a century: the *camera obscura*, the telescope, the microscope, and the collection of curiosities.

4. Books of wonders around 1700

In 1672, one year after the publication of De Lange's Wonderen des werelds, the last work to have Boaistuau as its direct model, the same

¹⁴⁰ Ibid., 106-107.

publisher, Marcus Doornick from Amsterdam, issued *Het schouwtoneel der aertsche schepselen* (Stage of earthly creatures). The authors, P. Nylandt and J. van Hextor, were both practising physicians in Amsterdam. A comparison of these two works reveals a world of difference. While De Lange's book presented a pot-pourri of curiosities and tall stories, the work by the physicians was systematically organised. Four separate sections dealt successively with the different peoples of the earth, quadrupeds, insects and snakes, and birds and fishes, all illustrated with engravings. This work is a compilation too, but the sources are now the modern natural historical literature. A particularly important characteristic, moreover, is that the authors frequently refer to empirical reality. They discuss animals recently discovered in East and West, that can be seen in cabinets of naturalia, or that can simply be found in the ditches and meadows of Holland.

In their foreword the authors nevertheless place themselves squarely in the tradition. Those who do not want to live like the heathen, those who do not live like dumb cattle, look at the world around them with wonder. The world is a 'living Holy Bible' (Biblia sacra viva). 141 The wonders of God are revealed in the Bible and in the Book of Nature. Through the study of this book, Christians are 'obliged and stimulated to respectfully honour each day the infinite power and goodness of God'. The 'atheists who have turned their backs on God' will 'have to stand silent with shame on their cheeks and downcast eyes'. 142 It is nevertheless striking that, after this attack on the atheists in the foreword, there are hardly any reflections of a religious kind in the body of the text. The descriptions of all kinds of creatures are fairly down to earth. The elephant is large, the horse is so familiar that there is hardly any need to describe it, the 'camel that was shown here to the eyes of the curious in 1643' was nine feet tall and had 'two sinewy lumps of flesh' on its back. 143 The comment on this camel is typical of the orientation of the book. The animals that often featured in books of wonders fifty years earlier are approached with scepticism. The authors state that there is much discussion concerning the existence of the unicorn. Now that various ships have brought the tusks of narwhals with them from the northern waters, the price has dropped sharply. The griffin is also

¹⁴¹ Nylant and Van Hextor, Het schouw-toneel der aertsche schepselen, A2/r.

¹⁴² *Ibid.*, A3/r.

¹⁴³ Ibid., 94.

SCHOUW-TONEEL

Der

AERTSCHE SCHEPSELEN,

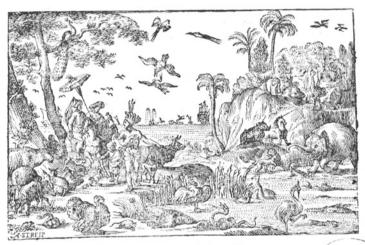
Afbeeldende allerhande

Menschen, Beesten, Vogelen, Visschen, &c.

Belchzijvende haer gestalte / hoedanigheden / natuur / krachten / engenschappen / en genegentheden; met 160 Figuren.

Door P. NYLANT, en J. van HEXTOR, beyde der Med. Doctoren, en Practicijns, binnen Amsterdam.

EERSTE DEEL.



t'A MSTERDAM,

3p Marcus Willemsz. Doornick, Beckberkoper / on depierkl. Gendam / in't Canton Juck-bat. Anno 1672.

Fig. 67. Title page of Nylant and Hextor, *Schouw-toneel der aertsche schepselen* (1672). Note the bird of paradise, obviously without feet. In the work itself all kinds of animals are depicted and described in a very matter-of-fact way (KB).

treated with circumspection: it may be that the creature does actually exist, or it may be an exceptionally large eagle, or a figment of the imagination. The same applies to the phoenix and the barnacle goose. The section on fishes has a brief discussion of the existence of mermaids, but it is nothing by comparison with the passages on whales, seals, cod, herrings and lobsters. The work also includes descriptions and illustrations of more or less common creatures such as oxen, bulls, cats, dogs, squirrels, carp, tortoises, thrushes, and sparrows.

We find the same shift of emphasis in a much larger book, entitled Wonderen der natuyre, of een beschrijvingh van de wonderlijke geschapenheyt der natuyr (Wonders of nature, or a description of the wondrous creation of nature, 1694). The work is broader in design, less down to earth, and contains considerably more religious reflections than Het schouw-toneel. It was published in octavo format, and was richly illustrated with rather crude engravings. The author concealed his identity behind the initials J.H.S.M.F. In the introduction the author sets himself in the tradition of the books of wonder. God's creation is a cabinet or a book. The Bible and 'the other open book, namely this world, otherwise known as the Book of Nature', are complementary. 144 The heathen can deduce from the creation that there is a God, but who he was, or in what his nature consisted, were hidden from their eyes. Only the combination of the Book of Nature and the Bible could lead people to true knowledge of God. This all sounds familiar enough. The study of the wonders of God's creation has recently received a strong impulse, the author continues, because of the increased interest in sensory perceptions. It is particularly thanks to the telescope and the microscope that more natural wonders have been discovered than were known to the ancient world. Van Leeuwenhoek is explicitly mentioned, whose Sendtbrieven had been appearing in the Philosophical Transactions and in Dutch collections for almost twenty years. 145 His observations appealed to the imagination in a fairly broad circle, and it is indicative that J.H.S.M.F. refers to him so explicitly. 146 The author also devotes particular attention to cabinets of *naturalia*. The 'wondrous works of art in the macrocosm' that God has given humankind are kept by some in the 'excellent cabinets of art and

¹⁴⁴ J.H.S.M.F., Wonderen der natuyre, 'Voor-reden'.

Palm and Snelders eds, Leeuwenhoek; Ruestow, Microscope, 146-200.

¹⁴⁶ Van der Saag, 'Rabus en Van Leeuwenhoek'; Jorink, 'Alle bedenckelijcke curieusheden', 109–111.

curiosities of nature'.¹⁴⁷ The author expresses the hope that these cabinets will be made accessible to a wider public more than is the case at present, preferably free of charge. Once again we see how close the connection is between the notion of the Book of Nature, the books of wonders, and the cabinets of curiosities. The inextricable link between them is not only established in the foreword, but runs through the whole book. The author has visited a number of cabinets himself, including that of the apothecary Swammerdam.¹⁴⁸

The author states explicitly in the foreword that he has based himself on the latest insights. The literature from which he cites is no longer confined to Boaistuau, his sources and epigones. The author often draws on (not particularly recent) accounts of countries and travels, such as Van Linschoten and De Laet. But anyone expecting to find an up-to-date survey in this 1694 publication will be disappointed. There are no direct references to the work of Boyle, Swammerdam and Huygens, for instance. Copernican theory is discussed without commentary. An important characteristic of the work is nevertheless that almost all of the natural phenomena, no matter how striking they may be, are considered to belong to the domain of natural causes. Comets are 'products' of the planets; their origin can be explained 'completely naturally'. The same naturalistic approach can be found in the reflections on springs, mountains, volcanoes and earthquakes, a subject that greatly fascinated this author, following in the wake of Kircher.

Traditional *mirabilia* are not lacking, but they are paid less attention than the new wonders from East and West. Borametz, the Lamb of Tartary, whose fleece the author has seen with his own eyes in the cabinet of Swammerdam senior, is presented as an authentic wonder of nature. A new generation of *naturalia*, those from East and West, is far more striking. An example is a fish that the Indians call 'Cassoorwa': it has four eyes, one pair above the surface of the water and one pair below. Other newly discovered creatures, such as flying fish and flying monkeys who live in the Orient, are also a cause for wonder. A two-headed serpent that a minister and friend had brought from Ceylon in 1692 is also of interest.

¹⁴⁷ J.H.S.M.F., Wonderen der natuyre, 'Voor-reden'.

¹⁴⁸ *Ibid.*, 457.

¹⁴⁹ Ibid., 90, 102.

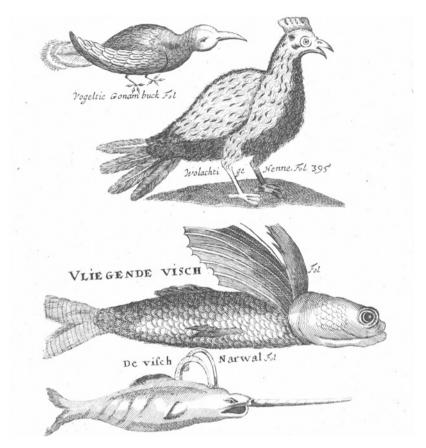


Fig. 68. Engraving from the anonymous *Wonderen der natuur* (1694, cf. Fig. 61), including a representation of a narwhal as evidence of the true nature of the tusk (KB).

Jan van Westerhoven

In the course of the seventeenth century, Dutch authors of books of wonders increasingly widened their horizon. The works they wrote came less and less to be written in the closed space of a study. The result of their writing followed a parallel course: they referred more and more to phenomena and artefacts that were in principle visible to all, in a cabinet or curiosities or, preferably, outdoors in nature.

A remarkable work in which this approach was taken to its extreme consequence was published in 1685. Jan van Westerhoven described in the voluminous *Den Schepper verheerlijkt in de schepselen of*

verhandeling van alle geschapene dingen (The creator glorified in the creatures, or a treatise on all created things) how everyone could see the hand of God in nature. Very little is known about the author. He was initially a member of the Mennonite community in Haarlem, but after a conflict he joined the less strict branch of the Mennonites known as the Waterlanders in 1683. The city of Haarlem had a flourishing cultural life at the time, and one of the expressions of this was a religiously motivated passion for natural inquiry. The initiative was often taken by dissenters like the Mennonites. The variegated natural surroundings of the city were repeatedly studied, illustrated and celebrated, and Van Westerhoven was no exception to the rule. By means of two protagonists, the reader is conducted on several walks around Haarlem and his attention is constantly drawn to all kinds of marvels in the apparently familiar natural surroundings.

Van Westerhoven's work is deeply rooted in a long tradition, as the frontispiece already indicates. It shows a man surveying a Dutch land-scape on which labourers are at work. The caption is clear and succinct: 'Romans I:20'. In the foreword Van Westerhoven remarks that people can recognise the hand of God in nature, but that his creatures often fail to notice it. The aim of his work is:

To exhort people...to view and consider the familiar things with attention. That is why the work is dedicated less to the scholar, who is occupied with lofty and well-nigh incomprehensible things to prove the Godhead, than to the simple but upright and well-intentioned.¹⁵⁴

This clearly shows the popularising intention of this book full of every-day wonders. In the dedication to the citizens of Haarlem, they are assured that there is no need to undertake perilous journeys to remote lands to see wonders; all they need to do is to open their eyes wide to the natural surroundings of their city. This message is underlined by the attractive engravings in the book. They present what appear to be realistic depictions of the meadows and dunes on the outskirts of Haarlem and are captioned with citations from *Psalm* 148 ('Hallelujah!

¹⁵⁰ Van Westerhoven, Den Schepper verheerlijkt in de schepselen.

¹⁵¹ Cf. Leeflang, 'De Natuur van Jacob van Ruisdael'.

¹⁵² Verheus, Naarstig en vroom, 61, 76.

¹⁵³ Sliggers, 'Honderd jaar natuurkundige amateurs'; De Jong, *Nature and Art*, 218–231.

¹⁵⁴ Van Westerhoven, Den Schepper verheerlijkt in de schepselen, 'Voor-reeden'.

Praise ye the Lord from the heavens: praise him in the heights'). The book is addressed more particularly to 'all pious wanderers'.

Van Westerhoven's text is couched in the classical form of a series of dialogues between Johannes Rogans and Paulus Verus, which take place during seven walks. As the names of the protagonists indicate, Johannes asks the questions, while Paulus explains the wonders of God's creation—we may assume that this name refers to the author of the Epistle to the Romans. Other points refer to the Bible as well. Each walk roughly corresponds to a day in the creation narrative. The chosen stylistic form and the very recognisable surroundings in which the friends stroll, talk, and constantly draw one another's attention to matters of interest are intended to ensure that the reader is fascinated by the everyday natural environment of Holland. Many discussions are conducted, and the friends frequently burst out in hymns. Every facet of God's creation that confronts them on their walks is a wonder: the firmament, the elements, the cycle of the seasons, the plants and animals, the course of the rivers, the woods, the animals that dart and creep in them, and the beautiful dunes of Holland. The people of Haarlem are lucky to have beautiful 'mountains' to hold the sea at bay and which are so delightfully covered with medicinal plants and 'sweet-smelling herbs', and which do not produce 'sulphurous and pestilential vapours as happens in Italy'. 155 Characteristic of Van Westerhoven's approach is that he regards the life-cycle of the mayfly as a bigger natural wonder than 'mermaids, griffins, dragons, centaurs, satyrs, basilisks and other nonsense and poetic ornaments'. 156 He does not give a source, but it is natural to suppose that Van Westerhoven's comments on the mayfly drew on Swammerdam's Ephemeri vita and not his own observations (the mayfly was not found in the Spaarne, the river that flowed past Haarlem). The fact that Van Westerhoven's work is based here and there on book knowledge does not alter the fact that, in his attempt to show the wonders of nature to 'simple folk', he adopts an anti-academic point of view. The numerous references to classical and contemporary literature that sometimes make other works of this genre virtually unreadable are almost completely absent, although they naturally played a major role in the background as a

¹⁵⁵ Ibid., 200.

¹⁵⁶ Ibid., 277.

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structuring element. All kinds of profound speculations on the how and why of diverse natural phenomena are relegated to the background. As Westerhoven himself puts it (via Rogans): 'this kind of philosophising is too lofty for me. The birds have voices, and so do the animals, but as far as the other things are concerned, I have never heard them make a sound'. As they discuss the sea, the two friends approach the shore and collect all kinds of shells with beautiful shapes that God has 'cut and incised, twisted, coiled and turned' in such a way that 'the most skilful craftsman' would be unable to imitate him. What simply lies on the shore here is collected at great expense and effort in the cabinets of collectors 'not a few of which were found in Amsterdam'. The library and cabinet seem to have become things of the past. Those who really want to know God in his creation go and observe it for themselves. That is when the order and purpose that govern nature are manifested.

The problem is, of course, that without knowledge of the Bible, nature can only too soon become the object of animistic or pantheistic ideas. Some heathen recognise God in nature, but this is only one step away from pagan nature idolatry. Paulus therefore repeatedly explains to his friend that, no matter how important the careful study of the wondrous works of nature may be, it must always be done from a biblical perspective. That is one of the reasons why Paulus keeps on citing 'edifying verses' such as Psalm 36:5: 'Thy mercy, O Lord, is in the heavens; and thy faithfulness reacheth unto the clouds'. Every natural phenomenon is set in a biblical context. By drawing attention to the order of nature and at the same time appealing to the Bible, a powerful weapon was forged against the atheists who claim that nature is merely the product of chance. The dunes are an example: if they did not exist, Haarlem would be flooded. That they keep the sea at bay is 'truly a great wonder and clear proof that these things were not created by chance'. 160 That God created the dunes in Holland can be seen from *Psalm* 65:6–7: 'Which by his strength setteth fast the mountains; being girded with power: Which stilleth the noise of the seas, the noise of their waves.'

¹⁵⁷ Ibid., 47-48.

¹⁵⁸ *Ibid.*, 237.

¹⁵⁹ Ibid., 237.

¹⁶⁰ Ibid., 210.



Fig. 69. View on Haarlem and its surroundings, taken from Jan van Westerhoven's *Den Schepper verheerlijkt in de schepselen* (1685). The caption is taken from Psalm 148: 'Praise ye the LORD. Praise ye the LORD from the heavens: praise him in the heights' (KB).

'There is no need to travel far to see wonders; just open your eyes properly in the place where you are'. The views of the dissenter are in this respect very similar to those of Swammerdam and of Levinus Vincent, whose cabinet in Haarlem exhibited not only all kinds of exotic things, but also sparrows, ducks, ravens and swallows. The wonder at the everyday that Augustine had already advocated was to become one of the key words in the physico-theology of the eighteenth century. In the light of this background, it is not surprising that Van Westerhoven's work still held a strong appeal in the heyday of that movement in the eighteenth century. The first edition of 1685 was reprinted in the same year that Nieuwentijt's *Regt gebruik* appeared, 1715, and again in 1737 and 1771. That the didactic, moralising character was perfectly in tune with the eighteenth-century ideal can be seen from the fact that the book was often presented as a prize to meritorious Haarlem school pupils in the course of that century.

¹⁶¹ Ibid., 18.

¹⁶² Vincent, Wondertooneel, passim.

¹⁶³ Verheus, Naarstig en vroom, 93, 220.

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5. Concluding remarks

When in 1715 Bernard Nieuwentijt published his Regt gebruik on 'the right way of contemplating the works of the creator' in an attempt to convince atheists and other infidels of God's revelation in the creation, he tackled a theme that was both popular and traditional. In his comprehensive survey of the order and regularity that prevailed in the divine creation, experiments with air pumps, microscopes, thermometers and chemicals played an important role. It has rightly been claimed that Nieuwentijt had an enormous influence as a populariser of experimental philosophy and physico-theology in the eighteenth century, both in the Netherlands and further afield. 164 Nieuwentijt restored respectability to natural inquiry, which had been discredited in orthodox circles as a result of Cartesianism and Spinozism. In fact, by means of his experimental approach, Nieuwentijt combated the atheists with their own weapons. He created a new synthesis between belief and science, Vermij has claimed. Experiments conducted in the wake of Boyle and Newton bolstered the thesis that God revealed himself in his creation. In addition, Nieuwentijt tried to demonstrate that contemporary discoveries in the natural sciences were already accounted for in the Bible. Vermij speaks in this connection of Nieuwentijt's 'preoccupation with strict literal exegesis' in his attempt to legitimate contemporary insights into the weight of air, the flattening of the earth at the poles, or the microscopic structure of the lilies of the field by appealing to the divine origin of the Bible. 165

It cannot be denied that Nieuwentijt had an enormous influence, nor that his battle against the atheists of his day was fought out with contemporary weapons. However, it is debatable whether we can simply qualify his work as something new and relate it exclusively to British influences such as Boyle, Ray, Derham and Newton. The traditional view of the relation between belief and natural science permits an affirmative answer to this question; if we follow the straight line of scholastic Aristotelianism, Cartesianism and Newtonism, as is usually

¹⁶⁴ Vermij, *Nieuwentijt*; Bots, *Tussen Descartes en Darwin*; Hooykaas, 'Natuuronderzoek'; Snelders, 'Professors, amateurs, and learned societies'; Israel, *Radical Enlightenment*, 461, 478 and passim; Idem, *Enlightenment Contested*, 385–386.

¹⁶⁵ Vermij, *Nieuwentijt*, 80–83.

done in the Netherlands, then Nieuwentijt's experimental philosophy did indeed offer something new. However, if we consider Nieuwentijt's work from the perspective of the changing ideas about the relation between the Bible and the Book of Nature, a somewhat different picture emerges.

Books that referred to the Bible and to nature to unfold the wonders of God's creation before their public were already widespread in the Dutch Republic in the seventeenth century. They too appealed to the order and purposiveness of the creation to exhort Epicureans and atheists to abandon their folly. The translated and often reprinted works of Boaistuau already stressed that nature obeyed the will of God. In principle everything in nature was a wonder in the sense of a source of religious wonder. The strongest emphasis in Boaistuau's Dutch epigones, however, lay on anomalies in nature: monsters, magical stones, remoras, unicorns and birds of paradise, all of which were equally common in the cabinets of curiosities of this period. These mirabilia played a lesser role in the books of wonders of Dutch theologians. Ministers such as Spranckhuysen and Le Maire displayed a remarkable predilection for apparently normal matters such as the course of stars and planets, the succession of the seasons, and the familiar fauna and flora. In their attempts to show the omnipotence of God, they deployed such 'wonders' in the first instance to convince atheists. The emphasis on the order of nature that was there for everyone to see was to become one of the most salient characteristics of eighteenth-century physicotheology.

The seventeenth-century books of wonders illustrate the change in the concept of wonder from rarity to regularity. Until around 1660, books of wonders were mainly compiled on the basis of other texts. The Dutch followers of Boaistuau based themselves primarily on their French model, supplementing it with excerpts from more recent travel accounts and natural histories. Theologians such as Le Maire and Feylingius took the Bible as their starting point and supplemented the biblical framework with borrowings from Cicero and the natural histories of their own day. In other words, books of wonders were mainly about other books. Exegetical discussions and developments in natural philosophy put pressure on this starting point. The literal biblical text proved by no means always to correspond with the new, rational, empirical view of nature. De Mey's important book *Halelu-jah*, of lof de Heeren verbreydt op het natuer-toneel (1666) should be regarded

as an attempt to harmonise newer interpretations of the Bible and the Book of Nature. This included many references to empirical and experimental inquiry, which of course was carried out with the instruments of the day: the *camera obscura*, the microscope and telescope, and the collection of curiosities. De Mey placed full emphasis on the structure and regularity of the creation. As such his work can be regarded as a precursor of Nieuwentijt's *Regt gebruik*. This raises questions with regard to the assumption that Nieuwentijt's work marked the start of a new tradition.

It is uncertain if the discussion of whether the publications of Boyle, Ray, Nieuwentijt or De Mey mark the beginning of experimental philosophy or physico-theology has much to recommend it. Such debates have a fairly abstract character, as they stand or fall with very strict definitions. It is far more useful to think not in terms of a beginning or end, but of continuity, transformation and change. It is clear that De Mey's work belongs to the long tradition of natural theology, follows more recent empirical tendencies, and displays a strong affinity with the emergent biblical hermeneutics. De Mey's work was in accordance with a particular Dutch tradition whose exponents include Hondius, Lansbergen and particularly Colvius. A large degree of religious sensibility was nourished by a creative handling of the Bible and by the deployment of contemporary natural philosophical methods and practices. In the case of De Mey, the result was a pioneering work in the Netherlands that, although its influence is hard to determine, is certainly illustrative of the process of intellectual transformation by which the axiom that the Bible is the exclusive key to the Book of Nature was critically evaluated, and both books were increasingly seen as independent revelations of God. In De Mey's case the result was complex: a revitalisation of Mosaic physics through philological and philosophical inquiry, combined with an unmistakable rationalisation of the biblical wonders. In both cases, however, the emphasis came to be placed more and more on the underlying order and structure of God's works, at the expense of prodigia and all kinds of wondrous stories. The tendency to consider the everyday wonders of nature with one's own eyes was continued in the remarkable work of Jan van Westerhoven, Den Schepper verheerlijkt in de schepselen (1685). With the Bible in their hand, the protagonists of this work strolled through the woods and dunes to sing the praises of the Lord at every blade of grass, insect or

bird. The work looks forward to the insect, snowflake and pile-worm theology that was to become so popular in the Dutch Republic in the eighteenth century. The book of wonders, like the Book of Nature, referred no longer to the library, but to the natural world of the Netherlands.



Fig. 70. Still life with globe, shells and butterflies by K. Lux, oil on canvas, 99×95 cm, ca. 1650. The nature and meaning of paintings like these are still a matter of controversy among historians of art (Instituut Collectie Nederland).

CHAPTER SEVEN

THE BOOK OF NATURE: FROM AXIOM TO METAPHOR

The atheist convinced

'I have read your lectures with very great pleasure', wrote Constantijn Huygens to the Leiden professor of theology Friederich Spanheim on 5 May 1676, 'and I approve of your plan to have them translated into Dutch'. The texts to which Huygens was referring had been published shortly before under the title *L'Athée convaincu, en quatre sermons,* and they were indeed also made available to Dutch who were unable to read French. Den atheïst, of God-verloochenaar, overtuycht in vier predikatien (The atheist convinced, in four sermons) was the title, above the words of Psalm 14:1: 'The fool hath said in his heart, There is no God'.

Spanheim is an interesting figure in connection with the present study. The orthodox theologian was a bitter opponent of Cartesians and other enlightened thinkers, but, unlike many followers of Voetius, he was not a dogmatist but a historian of the church and an exegete of international standing who had a great affinity with the emergent historico-critical interpretation of the Bible.⁴ In other words, he was one of those scholars who oscillated between the two extremes of biblicism and radical rationalism. It is characteristic of Spanheim's interests that he wrote a commentary on *Job*, a book filled with natural wonders; this commentary exerted a very strong fascination on Huygens and was to be reprinted down to late in the eighteenth century.⁵ Like so many, Spanheim considered that the contemplation and study of God's creation provided decisive arguments against the Epicureans, materialists and atheists. He expressed his convictions not only in books but also in sermons. Between the end of 1675 and the beginning

¹ BCH VI, 377.

² Spanheim, *L'Athée convaincu*.

³ Spanheim, Den atheist of God-verloochenaar overtuycht.

⁴ Thijssen-Schoute, Nederlands cartesianisme, 48–52; De Jonge, De bestudering van het Nieuwe Testament, 57.

⁵ Spanheim, Historia Jobi, sive de obscuris historiae commentario; Idem, Geschiedenis van Job. Cf. BCH VI, 313.

of 1676 he preached four times on godlessness from the pulpit of the Waalse Kerk in Leiden.

The timing was certainly not chosen at random, but should be seen partly against the background of the work of Spinoza, the publication of whose Tractatus Theologico-politicus in 1670 had caused an exceptional commotion in the Dutch Republic.6 The Leiden council of churches decided on 8 December 1673 to strongly urge the Grand Pensionary Fagel to have the book banned 'as vigorously as possible'. Four years after publication, the *Tractatus* was one of several books, including Meijer's Philosophia S. Scripturae interpres, to be banned by the Court of Holland. The motivation of the sentence adduced the argument that these blasphemous works were an assault on the 'authority of the Holy Scripture'.8 However, this did not eliminate the danger. On the contrary, while in 1675 the Leiden council of churches repeated its great concern at the 'undermining of the true Christian Reformed Religion', news spread that Spinoza had a second book in print.9 'Which rumour', the philosopher wrote to Oldenburg in September 1675, 'was accepted by many...When I understood this from certain trustworthy men, I decided to postpone the edition I was preparing' (the Ethica).10 In short, the ever present danger of heresy and atheism seemed to be very acute at this moment.

Although Spanheim's sermons against 'godlessness' were triggered by the present circumstances, he displayed a remarkable awareness of the historical context of this menace. Indeed, the need had never been so acute, now that various writers were changing religion 'in the twinkling of an eye', were presenting Moses as a wily politician, and were regarding the biblical wonders 'as entertaining stories, or simple works of nature'. Spanheim did not name his opponents, but it must have been clear enough to most of his audience whom he had in mind. He turned his wrath not only on these 'fools', but also on their Dutch publishers. They lent themselves only too readily

⁶ Cf. Van Bunge, 'Early Reactions'; Israel, 'Banning of Spinoza's works'; Idem, *Radical Enlightenment*, 275–285.

⁷ Freudenthal, Die Lebengeschichte Spinoza's, 136-137.

⁸ Groot Placaet-Boeck III, 523.

⁹ Freudenthal, Die Lebengeschichte Spinoza's, 145.

¹⁰ CHO XI, 482. Cf. Nadler, Spinoza, 333-340; Israel, Radical Enlightenment, 285-294

¹¹ Spanheim, Den Atheïst overtuycht, 'Voor-reden'.

¹² *Ibid.*, 123–124.

to the propagation of these blasphemous ideas, and paid no heed to the prohibitions imposed by 'our superiors'. 13 All the same, Spanheim seems to have had his doubts about the effectiveness of such measures. The main problem with atheism was that it could be found in every age, and that the fools cherished their heretical ideas above all in their hearts. Spanheim called atheism 'a hidden illness; there are few of these godless people who reveal themselves, as the first Atheists did in Greece; a Diagoras of Miletus, and a Theodorus of Cyrene'.14 The church historian sketched a dark picture of human history. According to him, it was characterised by the perfidious activities of all kinds of atheists. While Heurnius, for instance, had characterised Egypt only a few decades earlier as the source of all knowledge, Spanheim now regarded it as the empire 'to which Greece was indebted for all its superstitions'.15 Atheism had spread from ancient Greece like a forest fire, for example through the sect of the Epicureans, 'who say to one another we are born by chance'. 16 Spanheim then proceeded to provide an extensive survey of all of the false doctrines that had been proclaimed from antiquity down to his own day.

But there was another side to the coin. For example, there was a powerful argument against the atheists in the fact that even such heathen as 'a Plato, an Aristotle, a Cicero, a Seneca, a Plutarch, and so many learned men, had ascribed a sort of religion to the most savage and barbarian peoples'. So even those who had been denied the revelation of God's word still had a sense of religion. For centuries Christians had lived in the unshakeable conviction that God existed, and that he was the almighty and providential governor of the universe. Like all of the apologists who had preceded him, Spanheim also referred to the authority of the Bible and of tradition. To believe that there was not a God, the fool would first have to reject the scripture, then not believe in the existence of Christ, assume that the apostles had been 'excellent impostors', deny the works of the church fathers, and finally deny 'what has been confirmed for so many centuries, ratified by so many of the dying, and sealed by the blood of so many martyrs'. 18

¹³ Ibid., 123.

¹⁴ Ibid., 22.

¹⁵ Ibid., 135.

¹⁶ Ibid., 84.

¹⁷ Ibid., 101.

¹⁸ Ibid., 51-53.

If the atheists had gone through all these stages of scepticism, they still had a final hurdle awaiting them: they had to deny that 'this God is visible everywhere, and that all the wonders that the eye sees... proclaim his honour, and that the invisible things of him ... are clearly seen, being understood by the things that are made, even his eternal power and Godhead Rom. 1:20'.19 Nobody could deny that the creation was proof of the existence of a providential God. Like such theologians as Sprankhuysen, Le Maire and De Mey, Spanheim too pointed to the order of the cosmos, the succession of the seasons, the care of animals for their young, and so on. The theologian showed a remarkable sensibility with regard to more recent insights. Like De Mey, for instance, decades before Nieuwentijt Spanheim was already deploying contemporary insights from the natural sciences in the fight against atheism. For example, he praised the powers of 'these magnifying glasses or these telescopes, which have been invented in our century, [which] take our sight further than the eyes alone do'.20 Who was not convinced by the miracle of the circulation of the blood? Who except God had 'made the infinite number of small vessels, fibres and glands, not all of whose wonders are known, and which are food for thought for the bright sparks of this century'?²¹ Anyone who studied the creation was bound to be amazed by 'such skilful constructions, such admirable propagation, such regular laws, such a wondrous order, and such perfect harmony'.22 The atheists who maintained that the order of nature was no proof of the presence and providence of God were as foolish as

...a person who might argue that if the letters in a printer's shop were taken at random, or a pile of characters... were thrown into the air and completely jumbled up, they might be put together and assembled in such a way that it would be possible to see a book full of learning or a well-composed poem emerge from them.²³

It is evident which doctrine Spanheim is referring to here. The existence of God could be seen from 'this book of nature, in which such

¹⁹ *Ibid.*, 53.

²⁰ *Ibid.*, 75.

²¹ *Ibid*.

²² Ibid., 109.

²³ *Ibid.*, 110.

a beautiful combination of creatures can be found as the many letters that form a marvellous phrase'.24

Spanheim's sermons are a stimulating source in a number of ways. First of all, there is the strongly historicising perspective. Many observers regarded (and still regard) Spinoza's work as having given a radical twist to Cartesian rationalism, or even as something completely new. In 1678 the Leiden council of churches stated that the Opera Postuma 'has a godlessness unparalleled from the beginning of the world until now'. 25 Spanheim approached the danger with a measure of distance and explicitly stated that all kinds of materialist, rationalist and atheist currents had been manifest since the times of the Old Testament. In his view, human history was a constant struggle between the elect who believed in God and the many-headed hydra of atheism. In the light of this background, it is striking that the arguments that he deployed against the atheists were only derived to a limited extent from an appeal to the authority of the Bible. While supporters of the Further Reformation considered the status of the Bible to be above all discussion in terms of dogma, morals and physics, Spanheim adopted a less extreme position. It is characteristic that in his discussion with the 'fools', he was prepared to go along with their train of thought to a certain extent: anyone who deliberately rejected the authority of the Scripture could still be convinced in the last instance by the arguments from the Book of Nature. This is essentially a reversal of Article II of the Belgian Confession, according to which God 'makes himself known to us more openly [than in the Book of Nature] by his holy and divine Word'; the Confession only drew secondary arguments from the Book of Nature. Perhaps Spanheim's reticence had something to do with a growing awareness among orthodox theologians that descriptions of natural phenomena in some passages in the Bible had become problematical.

A striking characteristic of Spanheim's sermons is that although he repeatedly refers to arguments that apologists since Cicero had adduced, he rarely cites the biblical references. For instance, Spanheim went into detail into the question of the population of the earth and the closely related problem of biblical chronology.²⁶ He cites extensively from

²⁴ Ibid., 56.

²⁵ Freudenthal, Die Lebensgeschichte Spinoza's, 174.

²⁶ Spanheim, Den Atheïst overtuygt, 142–150.

the works of Scaliger and Isaac Vossius, as well as from the polemic on the origins of the Americans between Grotius and De Laet. If these issues had not called for discussion, Spanheim would not have bothered his audience (or readers) with them. How desirable it was for us to be 'less philosophers and more Christians! Less inquirers into nature and more devote towards its author!'27 However, Spanheim was rather vague about how this process of religious interpretation was to be effected. For Voetius it was evident that all possible knowledge about nature was essentially enshrined in God's Holy Word. On the other hand, a pious scientist such as Swammerdam saw the order and structure of the creation as an autonomous revelation of God: it was the 'Bible of God's wonders' from which in principle everyone could grasp his essence.²⁸ Spanheim seems to have adopted an intermediate position: the existence of God is demonstrated by both the Book of Grace and the Book of Nature. But in the light of the recent discoveries, what was the relation between them? This century, Spanheim sighed, may be 'the most enlightened of all in science and doctrine: but is it not also the most degenerate...that ever was?'29

The Book of Nature and the Holy Scripture

The atheist convinced is a good illustration of how ideas about the Book of Nature were changing in orthodox circles too. While around 1620 there had been a high measure of consensus among Reformist theologians, a differentiation now began to emerge. The a priori that the Book of Nature lay enshrined in the received text of the Scripture was no longer taken for granted by some theologians. Nor was it clear what status should be assigned to the results of contemporary inquiry into nature: did it threaten or confirm the revealed religion? And what were the implications for the orthodox doctrine of the *liber naturae*?

By the beginning of the seventeenth century the notion as such was not the object of discussion among Dutch theologians. The *liber naturae* was God's creation as understood on the basis of the Bible. It constituted a single, homogeneous discourse that was shared equally by theologians, philosophers of nature and poets. This discourse structured Reformist thinking about the relation between exegesis and

²⁷ Ibid., 132.

²⁸ Swammerdam, Bybel, 418.

²⁹ Spanheim, Den Átheïst overtuygt, 120.

reflections on the creation. The Dutch interpretation of the notion of the Book of Nature closely followed the Augustinian tradition. The Book of Nature thus assumed a privileged position *vis-à-vis* the comparable, essentially strictly secular notions such as the *theatrum mundi* or the world as work of art. Following the axiom formulated in the Belgian Confession and elsewhere that the Bible was the primary source of knowledge of God, and that the creation was a 'beautiful book' in which all of God's creatures were like letters, the discussion focused on the doctrinal issues of the correct relation between natural and revealed theology, and how specific biblical passages on natural phenomena were precisely to be interpreted now.

The biblicism of the Further Reformation was important in this connection. From the 1630s, Voetius-following Danaeus-stressed that the Bible was the alpha and omega of all knowledge, and that the Bible was self-explanatory.³⁰ This reduced the interpretative space (and thus the risk of heterodox interpretations) for the Book of Nature to a minimum. In the view of this influential theologian, there was no truth outside the text of the Bible. Without the Bible, there simply was no Book of Nature. The key to the deciphering of the latter lay embodied in the literal text of the Bible, which was regarded as essentially timeless and transparent. Contemporary references to the Bible as 'a pair of spectacles' or 'an interpreter' with which to read the Book of Nature should thus be taken very literally.³¹ These terms suggested that there was a certain distance between the creation and the Bible, but at the same time implied that the interpretation of the former was entirely unproblematic. Anyone who read in the Book of Nature through biblical lenses saw the ant as an exhortation to industriousness, regarded a mummy as a tangible manifestation of the sojourn of God's chosen people in Egypt, and was bound to regard the Amerindians as nothing but the descendants of Noah.

By raising questions with regard to the classical and Christian corpus of texts, and more particularly thanks to the emergence of historico-critical biblical studies, both the definition and the interpretation of the Book of Nature came to be considered problematic in the course of the seventeenth century. We should think here in the first instance

³⁰ McGahagan, Cartesianism, 60-65; Van Ruler, Crisis of Causality, 20-32.

³¹ See for example: De weken vanden Edelen Gheest-rijcken Heer van Bartas, 6; Sprankhuysen, Macrocosmus, 5.

not of the radical Spinozist variant, but of a tendency that was in fact already implicit in the method of a humanist like Erasmus.³² Although it has not often been recognised as such, there is a thread leading from Scaliger via Saumaise and Isaac Vossius to Spinoza. The Dutch Republic proved to be a fertile breeding ground not only for the philosophy of nature, but also for philology and biblical studies. It was both currents that contributed in a dialectical way to the changing seventeenth-century conceptions of humankind and the cosmos.

A great service has been rendered by Jonathan Israel in drawing the attention of an international public to the importance of the developments that were taking place inside the Dutch Republic for what he has called the 'revolutionary transformation in European culture'.³³ Israel locates the source of the 'making of modernity' in the 'rise of powerful new philosophical systems, rooted in the scientific advances of the early seventeenth century'.³⁴ The most important factor in this process, according to the historian, was the radical biblical criticism of Spinoza:

The key feature of the tradition of Bible interpretation instituted by Spinoza, and elaborated by Meyer, Koerbagh, Isaac Vossius, Goeree and later Toland... was precisely *its strictly philosophical character, its use of philosophy* not just to uncover discrepancies in the Biblical text or elucidate perplexing passages in the light of historical context, but to assess its significance, thereby completely detaching our view of Scripture from any theological grounding and ecclesiastical authority.³⁵

Leaving to one side the debatable claim that it was Spinoza who inspired Isaac Vossius, Israel pays little attention to the linguistic roots of Bible criticism, the *eruditio trilinguis*. Since the days of Scaliger, the biblical texts in Hebrew and Greek had been subjected to strict philological scrutiny. That study, which was usually but not exclusively carried out by the faculty of *artes*, concentrated on the syntax and grammar of the books of the Bible, on variant readings and conjectures, and raised questions regarding such issues as the authorship and historical con-

³² Cf. De Jonge, Van Erasmus tot Reimarus; Idem, De bestudering van het Nieuwe Testament.

³³ Israel, Radical Enlightenment, 14 and passim.

³⁴ Ibid.

³⁵ Ibid., 449, italics are mine.

text in which these texts had been created.³⁶ Although its purpose was different, this form of research gradually converted the revealed word of God into a historical document that did not differ intellectually from any of the other texts that had been handed down from antiquity. This, as Israel rightly points out, was indeed to have far-reaching consequences. However, Scaliger had already noted—in annotations that were not published during his lifetime—that the manuscripts of the New Testament available in his day were 'very corrupt', and that the citations from the Bible cited by the church fathers were probably more reliable.³⁷ In the same spirit, a theologian like De Mey was to call into question the attribution of the Epistles to Paul on the basis of linguistic research and to speculate on natural explanations for the biblical miracles. A much more radical philologist, Isaac Vossius, was to boldly claim in 1659 that there was no longer any reliable transcription of the Pentateuch extant, and that it was thus foolish to believe that the Bible came directly 'from heaven'. 38 In other words, the form in which the Bible had been transmitted was a matter for discussion long before the publication of the Tractatus.

Of equal importance was the fact that the *content* of God's word was not unproblematic either. Biblical chronology was extremely important in this connection since it yielded the framework in which the distribution of peoples, languages, flora and fauna was understood. Here too Scaliger—whether intentionally or not—determined the direction of future inquiry: the scrutiny of the biblical text in the light of other written sources. In this respect we can regard La Peyrère's *Praeadamitae*, published in the Dutch Republic in 1655, as the new paradigm. Although there were hardly any defenders of Preadamitism in the Dutch Republic, the book was to determine the parameters of discussions of the authority of the Bible, the antiquity of the earth and the status of the history of non-Christian nations for decades. There is probably much truth in the observation that the Voetian Koelman made in 1692: Spinoza's biblical criticism was based 'on the foundations of Peyrerius'.³⁹ The works that Isaac Vossius wrote around 1660

³⁶ De Jonge, De bestudering van het Nieuwe testament; Van Rooden, Theology, Biblical Scholarship and Rabbinical Studies, 132–157.

³⁷ De Jonge, De bestudering van het Nieuwe Testament, 21.

³⁸ Vossius, *Discours*, 12. See also Jorink, "Horrible and Blasphemous"; Grafton, 'Isaac Vossius, Chronologer'.

³⁹ Koelman, Het vergift, 276.

in reaction to La Peyrère also proved to have a very strong influence. Spanheim devoted a lot of space to these issues in his *The atheist con*vinced, and in his very learned Chronologia Sacra of 1687 he was to bitterly attack the 'pseudo-philosophy' of Vossius, who remorselessly subordinated the traditional biblical chronology, and with it the Bible itself, to such systems as Chinese almanacs (sinensium fabulae).40

Within the already problematic biblical framework of cosmology, geography and chronology there were numerous questions of detail that also put pressure on the Voetian exegesis, and with it on the orthodox interpretation of the Book of Nature. In the previous chapters we have examined in detail the discussions of the significance of comets, the question of the existence of rhinoceroses, and the identification of biblical flora and fauna. For instance, the follower of Cocceius Hendrik Groenewegen commented on the biblical descriptions of Behemoth and Leviathan that they 'have puzzled the greatest lights of theology; yes, indeed myself in reading their doubts'. This did not prevent him from engaging in some speculation himself: he claimed that Behemoth was the rhinoceros (Rhenoster) and Leviathan 'a whale in the turbulent sea'. 41 Taken on its own, probably none of these questions posed a threat to the axiom that the Bible should also be taken literally on matters relating to natural inquiry, but anyone who surveyed them all in the second half of the seventeenth century would be bound to come to the conclusion that the relation between the Bible and the Book of Nature was not unproblematic. The Bible was not a transparent lens, but an exceptionally voluminous and difficult book. Nor was it an interpreter. On the contrary, anyone who wanted to understand the letter of the Scripture had to have a thorough grasp of Hebrew and Greek.

These problems that became manifest around 1660 resulted in a complex development.⁴² It is relevant here that Dutch scholars subjected the relation between the Bible and the Book of Nature to a fresh scrutiny. The discourse on the Book of Nature that had been uniform until then disintegrated, and from now on we can distinguish different currents. First of all was the Voetian camp, which in spite of the necessary modifications still clung to the belief that the Bible was the key to

⁴⁰ Spanheim, Opera omnia I, 142-146.

di Groenewegen, Hieroglyphica, anders emblemata sacra, 81–83.
 Cf. Van der Wall, 'Religious Context'.

the Book of Nature. Thus in his discussion of comets, the Voetian De Cocq claimed that God spoke by means of both the Bible and the Book of Nature: 'the voice of the Lord is in both'.⁴³ Diametrically opposed to this was Spinoza, who seemed to equal *Deus* with *Natura*, which excluded in principle the whole notion that nature was the bearer of a *supernatural* significance.

There were also two more moderate tendencies. An influential one was the current that, partly inspired by the ideas of Descartes and Cocceius, tried to separate the biblical text from philosophy. In connection with the discussion of Copernicanism, the theologian Wittich claimed that, through the revelation, the Bible was the source of Christian moral doctrine. The Bible was a strictly theological work, and simply did not contain any information bearing on the physical world. Balthasar Bekker followed the same line of reasoning when he proposed that the Bible and the Book of Nature were two *separate* books of God. The two books of nature and grace' each spoke their own language, and each one should be understood in its own particular way: natural inquiry would not bring blessedness, but neither could the Bible serve to understand nature. Still, the existence of a providential God was incontrovertibly demonstrated by the order and harmony of the creation. The strength of the creation.

A parallel tendency enjoyed currency among more orthodox theologians such as Spanheim, who display an increasing propensity to separate the Bible from the Book of Nature. However, in these circles the appreciation of the *liber naturae* did not increase, but declined. It is important to realise that, when Spanheim talks about the Book of Nature, he does not do so from the traditional point of view that this book can only be understand on the basis of the Bible.⁴⁶ In Spanheim the notion has acquired the character of an analogy: just as the order of a sentence or a book indicates that there is an author, the Book of Nature shows that there is a God The notion has here lost its privileged status, as recorded in the Belgian Confession and other texts, *vis-à-vis* similar ideas such as the *theatrum mundi*. Thus Spanheim can describe the creation as the 'Book, Building, Spectacle of the World'.⁴⁷ The Book

⁴³ De Cocq, Cometographia, 44.

⁴⁴ Vermij, Calvinist Copernicans, 256-268.

⁴⁵ Bekker, Ondersoek, 97-98; Idem, Friese godgeleerdheid, 691.

⁴⁶ Spanheim, Den Atheïst overtuygt, 56.

⁴⁷ *Ibid.*, 110.

of Nature is here understood not as a reference to the Bible, but as a work of art that, like a building or a painting, presupposes an artist:

For what are all the forces of nature but like a brush in the hand of the master, or as colours on a palette, that a wise painter prepares, mixes, arranges, and uses to make representations from life (*naer 't leeven*).⁴⁸

The example of Spanheim shows how the Book of Nature has lost its privileged position in orthodox circles as well. From now on it becomes just one of the many metaphors for the creation. We see the same tendency among scholars who, for whatever reason, had less affinity with the Voetian exegesis. Both the critical theologian De Mey and the Mennonite collector Vincent regarded the creation in the first instance as a 'stage of wonders', even if eulogists of their work immediately supplemented this qualification with references to the Book of Nature.⁴⁹

A final current simply ignored the notion of the Book of Nature. An important work like Nieuwentijt's *Regt gebruik*, for instance, does not include any such references, though we can only speculate why. Apparently the questions raised concerning the authority of the Bible were of no interest to Nieuwentijt, although he carefully skirted the exegetic problems connected with heliocentrism and the significance of comets. Page after page, the physico-theologian enthusiastically explains that all contemporary knowledge of the natural sciences was already enshrined in the scriptures. The divine origin of the Bible can be deduced from the fact that in the era of the Old Testament those insights 'were not known to any living person'. 'And to whom should this be attributed, from whom it can reasonably be considered to have derived, than from the almighty creator of all?'50 Only the Bible was the revelation of God. It might be argued that Nieuwentijt avoided the term 'Book of Nature' because it suggested that the creation was a second revelation, independent of the Bible.⁵¹ Arguments drawn from natural inquiry played an important but essentially subordinate role for Nieuwentijt. They were instrumental in the struggle against those who denied the existence of a providential God, but the ultimate goal

⁴⁸ Ibid., 158.

⁴⁹ De Mey, Al de Nederduitsche wercken, 410-522, 622; Vincent, Vervolg van het Wondertooneel, (unpaged).

⁵⁰ Nieuwentijt, Regt gebruik, 28; Vermij, Nieuwentijt, 80-83.

⁵¹ Vermij, 'Nature in Defence of Scripture'.

was the confirmation of the authority of the scriptures. Qualifying the creation as a second book of God would only divert the reader's attention and unnecessarily complicate matters.

However that may be, the term 'Book of Nature' becomes less and less common in the sources of the eighteenth century, and as for those writers who did use the term, they did so in a very different context from that of the previous century. An example of the deconstruction of the discourse on the Book of Nature is provided by the popular periodical that the Amsterdam physician and journalist Willem Ranouw began to publish in 1719, the *Kabinet der Natuurlyke Historiën*, *Konsten en Handwerken* (Cabinet of Natural History, Art and Handicrafts).⁵² This periodical, that has to be seen against the background of the eighteenth-century physico-theology, suddenly makes mention of 'Three different books' from which the almightiness, providence and love of God can be seen, namely:

1. The Holy Scriptures. 2. Nature, with all its wonderful creatures. 3. Art with all its works produced by unfathomable capacities, which people have received to that end from God. The true Divine Stamp (*Character Divinus*) is engraved in these three books.⁵³

We are here far removed from Article Two of the Belgian Confession with its reference to the dual unity of the Bible and the Book of Nature. The latter has now become just one among many interchangeable metaphors. The image of the Book of Nature was still to play an important role in Dutch reflections on nature at the beginning of the twentieth century. But the heyday of the *liber naturae* was definitively over. Seen from this perspective, the publication in 1737–1738 of Swammerdam's *Bybel der Natuure* was both a resounding final chord and the manifestation of a much more long-term tendency to worship God in the order, regularity and beauty of his works.

Concluding Remarks on the Book of Nature

Was there a specifically Dutch interpretation of the Book of Nature? Given the lack of comparative European research, this question has to be tackled with a measure of caution, but a few comments are still

⁵² Vermij, *Nieuwentijt*, 132–133; Beukers, 'Willem van Ranouw'; De Vet, 'Spinoza's "systema" afgewezen'.

^{.53} Kabinet der Natuurlyke Historiën, Konsten en Handwerken I (1719), 'Dedicatie'.

⁵⁴ Van Berkel, 'Heimans en Thijsse en het boek der natuur'.

in place. Source inventories and secondary literature indicate that the expression 'Book of Nature' was extremely common in early modern European culture.⁵⁵ Numerous scholars and poets interpreted the notion in numerous different and often mutually incompatible ways. The striking feature of the Dutch discourse on the *liber naturae* is that it was extremely uniform. Discussion was conducted within the limits set by Augustine: the Book of Nature had to be considered together with the Bible. For the period 1575–1715, I have been unable to find a single reference to rival interpretations of the notion on the part of Dutch theologians or other scholars. Paracelsus' anti-academic interpretation, Montaigne's more moralising interpretation, or Galileo's claim that the Book of Nature could only be read by mathematicians do not appear to have played any role at all in the culture of the Dutch Reformed Church in the early modern period. There is not a trace of Bacon's ideas on 'the Book of Nature' either. In other words, it looks as though the Dutch discourse differed from that elsewhere in Europe in its extremely high level of homogeneity. The fact that the doctrine was codified in the Belgian Confession will no doubt have played a strongly structuring role. Article II, in which the axiom was posited that there was a direct connection between the scriptures and the 'beautiful book' of nature, functioned as the starting point for theological dogmatists and more practical activities. Within the European context, it was unique for an influential religious movement to elevate the Book of Nature to the level of a dogma. Although the Dutch Reformed Church was not the official state religion, it was a privileged denomination, and anyone with an eye on a public office was obliged to subscribe to the Heidelberg Catechism, the Five Articles against the Remonstrants, and the Belgian Confession. The theory of the two books of God was thus part and parcel of the mental luggage of preachers, administrators and professors. The seventeenth-century scientific culture, in which not only philosophers of nature but above all botanising ministers, collecting philologists, gardening poets and all kinds of *liefhebbers* played such a prominent role, derived its motivation and legitimation to a large extent from the idea that all creatures, 'great and small', were letters from the Book of Nature.

⁵⁵ Cf. Curtius, *Europäische Literatuur*, 324–326; Rothacker, '*Buch der Natur*'; Scholz, 'Marginalia'; Harrison, *The Bible*, 121–160.

The nature and style of the practice of science in the early modern Netherlands has been the subject of a vigorous discussion in the last few decades. It has often been qualified as pragmatically descriptive, utilitarian and non-metaphysical.⁵⁶ Many historians of science based their verdict in particular on the group of Dutch scholars who played a crucial part in their vision of the seventeenth century: the 'bright sparks' associated with Stevin, the philosophers of nature, and the mathematicians who were active inside and outside the university walls. The most famous Dutch scientist, Christiaan Huygens, is also held to be an aloof scholar absolutely detached from religious reflections.

If, however, we approach the scientific culture of the early modern Netherlands from the contemporary discourse on the Book of Nature, a very different picture emerges. What is now striking is the nondescriptive, hermeneutic and sometimes emblematic approach to the creation. The Book of Nature was not studied for itself, but in order to draw religious lessons from it. Seen from this angle, Johannes Swammerdam's entomological researches are more exemplary of Dutch scientific culture than Christiaan Huygens' pragmatic mathematical approach. That metaphysical approach concentrated on matters difficult to qualify as particularly utilitarian. Dutch scholars inside and outside the academy were fascinated by comets, hieroglyphs, birds of paradise, stones from holy mountains, unicorns, and the fossilia that were found all over the world. In their conversations and writings they engaged in deep speculation on the etymology of the names of medicinal plants, the moral significance of the stages from caterpillar to butterfly, the history of the Chinese, the identity of the miraculous tree under which Jonah sought shelter, the relevance of Pliny's dictum that nature showed its greatness in its tiniest creatures, and the problem of the universality of the flood. Much money and effort went into collecting, preserving and exhibiting moonfish and monsters, exotic plants and foreign beetles. In a similar way, all kinds of products of the natural world featured in emblem books, still-lifes and in treatises of natural history.

The *liber naturae* thus offers us an interpretative framework in which to examine the seventeenth-century culture of the Netherlands in a

⁵⁶ See for example: Hooykaas, *Experientia*, 35–36; Van Berkel, *Voetspoor van Stevin*, 16 and passim; Cohen, 'Open and Wide'; Van Berkel, 'Nationale stijl en wetenschappelijke cultuur'.

different light and in which different emphases emerge. For instance, the interest of humanist scholars such as Barlaeus, Gerardus Vossius, Saumaise, Graevius and, above all, the curious and equally influential Isaac Vossius was not confined to the purity of Latin and Greek, but extended to the wonders of nature. The collecting activities and linguistic speculations of Heurnius, Brinck, De Laet and Witsen can also be understood from this perspective. It is further important to note that, long before Nieuwentijt, a group of theologians including Hondius, Lansbergen, Colvius, De Mey and Spanheim tried, partly on the basis of the results of contemporary natural inquiry, to convince heathen and atheists to repent.

An issue that has not been dealt with in the present study but which nevertheless deserves consideration is to what extent the flourishing genres of the still-life and the representation of objects of the natural world from life can be brought into connection with the Book of Nature. A debate on this has been going on for a quarter of a century among the circles of art historians, especially since the publication of the highly controversial The Art of Describing by Svetlana Alpers in 1983.57 Was Dutch art descriptive or symbolic in character? And, if symbolic, was it just referring to vanitas-motives, as many scholars have tried to point out? Should art historians look for points of contact in the developments in the seventeenth-century philosophy of nature and natural history? Did Dutch art have a religious significance? The arguments for and against the latter question have often been taken from Calvin (pro) and Descartes (con). An illustration of the latter can be seen in the study by Paul Taylor of floral painting in Holland. After a long and useful introduction in which these still-lifes are placed in an intellectual context, the author refers to Descartes and arrives at the debatable conclusion that there could not be any connection between the two: 'The Bible of Nature, in the seventeenth century, had long lost its intellectual vitality'. 58 Like many other scholars, Taylor identifies natural inquiry in the Netherlands with Cartesian mechanicism. However, the question has to be treated with more care. One has only

⁵⁷ See for example De Klijn, *De invloed van het calvinisme op de Noordnederlandse landschapsschilderkunst*; Bakker, *Landschap en wereldbeeld*; Leeflang, 'Jacob van Ruisdael'. On the Dutch reception of Alpers' *Art of Describing*: De Mare, 'De verbeelding onder vuur'; a more general discussion of the problem of 'realism': Franits ed., *Looking at Seventeenth-Century Dutch Art*.

⁵⁸ Taylor, Dutch Flower Painting, 42.

to think of the work of Joris Hoefnagel or Johannes Goedaert, but also of the wonderful drawings produced by Johannes Swammerdam himself, in which illustration, textual references and religious symbolism formed a mutually reinforcing system. Representation from nature *ad vivum* by no means meant the exclusion of a deeper meaning: it could even be claimed that representing (part of) the creation as naturalistic as possible was an extremely religious activity, as Swammerdam explicitly stated. One had to study the Book of Nature very carefully. There was no contradiction between a moralising, a religious and a scientific approach.⁵⁹

This brings us to the question of how the twentieth-century concepts of the Scientific Revolution and the Mechanization of the World Picture relate to the conventional interpretation of the Book of Nature in the Dutch Republic in the seventeenth century. Whether an answer is meaningful or not depends to a large extent on how we understand the first two concepts. I take them to be related concepts that may enable the historian today to capture a process in a striking image.60 Still, like the term Enlightenment, closer examination reveals them to be highly problematic, so in this case too we have to weigh our words with care. There can be no doubt that the learned conceptions of the universe underwent profound changes between the sixteenth and the eighteenth century. There is a large degree of consensus among historians (of science) today regarding the essence of that transformation: it was the transition from a closed, teleological cosmos that could be understood in qualitative terms to a universe that was in principle infinite, that was regulated by natural laws, and that could be described in quantitative terms. This, however, is where the problems begin. The Scientific Revolution was and still is often seen as a historical fact. Starting from this a priori, many attempts have been made to locate the causes of that revolution. Depending on the mental orientation of the researcher, these have been sought in, for example, the influence of Platonism, the introduction of a corpuscular notion of matter, the rise of mechanics, the success of experimental physics, or the foundation of scientific societies. The list of sources, connections and accents

⁵⁹ See also Van Berkel, 'Nationale stijl en wetenschappelijke cultuur', 298 note 12; Weststeijn, *Visible World*, passim.

⁶⁰ See for example: Lindberg, 'Conceptions of the Scientific Revolution'; Cohen, *Scientific Revolution*, 1–151 and 506–525; Van Berkel, 'De wetenschappelijke revolutie'; Shapin, *Scientific Revolution*.

can be expanded *ad infinitum*. Bookshelves could be filled with works dealing with the question of whether religion stimulated or held back the Scientific Revolution.

Around 1700 the world as seen by learned eyes looked very different from how it had looked a century earlier. One expression of this change was the admiration for the order, structure and diversity of the creation. This form of admiratio had always formed an undercurrent, but now it fully emerged to the surface at the expense of reflections on the miraculous, the occult and the bizarre. However, if we were to describe this process in the context of the Dutch Republic as the result of the Scientific Revolution or as the consequence of the introduction of the Cartesian notion of a law of nature, we would raise more questions than we would answer. For instance, such terms do not explain why in the course of the seventeenth century comets were no longer assigned an exclusively ominous significance, nor why it was the humanists who were the first to be so fascinated by the microscope. That scholars were increasingly racking their brains over such matters as the construction of the Ark of Noah, the distribution of nations and animal species over the continents, or which language was spoken before the destruction of the Tower of Babel is left completely out of the picture. In other words, not enough attention is paid to the crucial point that the contemporary scientific discussions took place between the twin poles of rationalism and textual criticism.

Not until the extremely complex textual system of commentaries, marginal annotations and references to the canon of the biblical and classical texts had become the subject of debate could a new way of conferring significance on nature take share. The disintegration of the corpus, the critical evaluation of the form, content, meaning and relevance of each text in itself, was a protracted process, basically rooted in humanism and the Reformation. Infinite patience was lavished on the study of the classical texts, focusing on internal inconsistencies, the use of language, dating and extant variants. This internal critical approach, and external scrutiny in terms of the world that could be perceived by the senses, led to a growth of the awareness that the world of the Egyptians, Israelites, Greeks and Romans had been different from that of the seventeenth century, and that the writings that had been preserved had to be seen in their historical context. The Bible was no longer a guide to the physical world, nor the exclusive and essentially unproblematic key to the Book of Nature. The listing of etymologies,

the provision of references, and the search for analogies, in short, the whole textual web in which reflections on nature were embedded was unravelled.

The key texts discussed in the present publication—Graevius' Oratio de cometis of 1665, Swammerdam's Historia generalis insectorum of 1669, and De Mey's Halelujah of 1666—all display the same pattern in this respect: a critical distance from the textual tradition, accompanied by a growing emphasis on the underlying structure of God's creation. The image of a divine architect, almighty artist or intelligent designer is not new, nor did it suddenly become topical after the publication of Darwin's Origin of Species in 1859. Seventeenth-century scholars in the Netherlands picked up ideas that had been formulated long before by Seneca, Cicero, Pliny the Elder and Augustine.

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